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American Journal
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Vol. 35 JANUARY, 1949 No. 1

Original Articles

REPOSITIONING THE MANDIBLE—TWO CASES

ASHLEY E. HOWES, D.D.S., NEW ROCHELLE, N. Y.

THE two cases here described present two small bits of evidence on the possibility of repositioning the mandible. By repositioning the mandible, I mean changing the positions of the condyles in their fossae when the teeth are in centric occlusion. The general dentist does this by adjusting the occlusion by grinding the teeth or building them up. The orthodontist often attempts to do it by means of a guide plane combined wih voluntary muscular efforts. In the two cases selected, the movements the teeth have undergone in relation to their supporting bone will be demonstrated by orthographic projections of the models before and after treatment.

Fig. 1 is an orthographic projection of the teeth and basal arch outlines of a normal occlusion.[1] The cusps of the premolars and also the molars have been connected by straight lines to point them out. The maxillary apical base outline is solid; the mandibular is dotted. Calling this the apical base line could be criticized, because sometimes the model does not extend up to the level of the apices of the teeth, and, therefore, the survey cannot be opposite the apices of the teeth. In the mandible, the model rarely ever extends down to the apical area, and so the survey represents the alveolar process at its most constricted area, generally about 8 mm. below the gingival margin. Salzmann[2] refers to these areas as the basal arches and has suggested to me that the survey lines be termed the basal arch outlines. In the map of normal occlusion, observe the symmetry of the various lines and how the maxillary basal arch outline falls directly over that of the mandible. If this map is folded on the sagittal plane, the basal outlines, every cusp, every groove, every gum line, in other words, every point in one side of the denture will almost exactly superimpose the corresponding point in the other half of the denture.

Read at the Forty-fourth Annual Meeting of the American Association of Orthodontists, Columbus, Ohio, April, 1948.

The first case, 1182, is one of mesioclusion or Angle Class III. The photographs before and after treatment are shown in Fig. 2. The case is being shown not because a good result was obtained, but because it demonstrates several interesting points, and it has been out of retention long enough to be considered stable. The only pertinent fact which the history brought out was that the girl's father also had a similar condition. The models of the original condition and the models of the case after treatment are shown in Fig. 3. Unfortunately, the original models of this case and also of Case 1064 were made from compound impressions, as at that time I had forsaken plaster as an impression material and had not yet adopted the hydrocolloids for routine use. The alginates had not yet been developed. Notice that the maxillary right cuspid is squeezed out of the arch and that all the maxillary teeth from the left lateral incisor to the right first molar, with the exception of the blocked-out cuspid, are in linguoversion when the teeth are in centric occlusion.

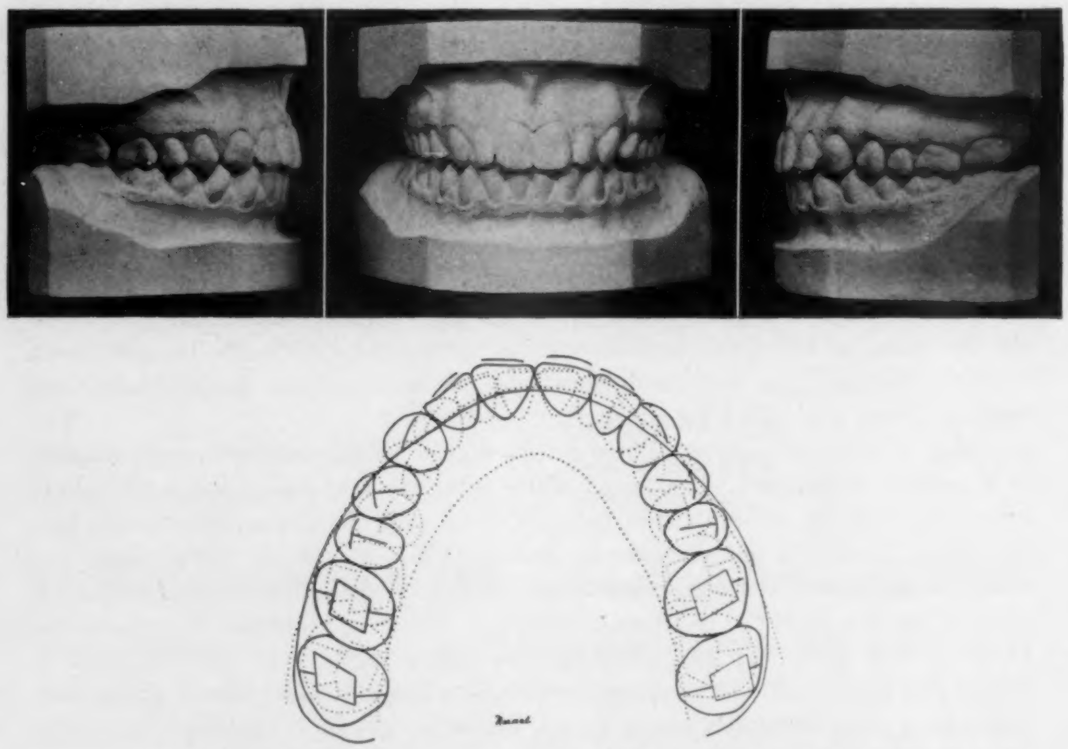

Fig. 1.—Models and survey of normal occlusion. Maxillary teeth and basal arch outline solid, mandibular teeth and basal arch outline dotted.

By opening her jaw, the child could retrude the mandible until the mandibular and maxillary incisors were almost edge to edge, but, of course, she could never masticate in this position because the posterior teeth were about 5 mm. apart. Therefore, in centric occlusion and in mastication, this girl's condyles were well forward of their normal positions and had been in that position for a number of years. More about that later.

In planning the treatment for this case, some thought was given to the possibility of extracting four premolars, because it was obvious that if the maxillary anterior teeth were moved far enough forward to allow the mandible to move back into normal centric relation, there would be excessive labial inclination of these teeth. Furthermore, some of the space for the blocked-out maxillary right cuspid should be gained by a distal movement of the buccal teeth on that side, a movement which could certainly not be accomplished with intraoral force, considering that Class III elastics were indicated. On the other hand, if maxillary first premolars were extracted, it would also be necessary to extract the mandibular first premolars, and that would mean an excessive lingual inclination of the mandibular incisors, in order to close the spaces.

Fig. 2.—Case 1182. Angle Class III case before treatment, left; after treatment, right.

It was, therefore, decided to maintain a full complement of teeth, to expand and lengthen the maxillary arch, and to retract the mandible into its normal centric occlusion by means of intermaxillary elastics. At the end of a

month's treatment the child was able to close her anterior teeth edge to edge, due, of course, to a small amount of tooth movement and to a large extent to the condyles slipping back into their fossae. The anteroposterior relations were corrected at the end of six months, part of which time elastics were not worn consistently. At the end of one year, appliances were removed for six weeks

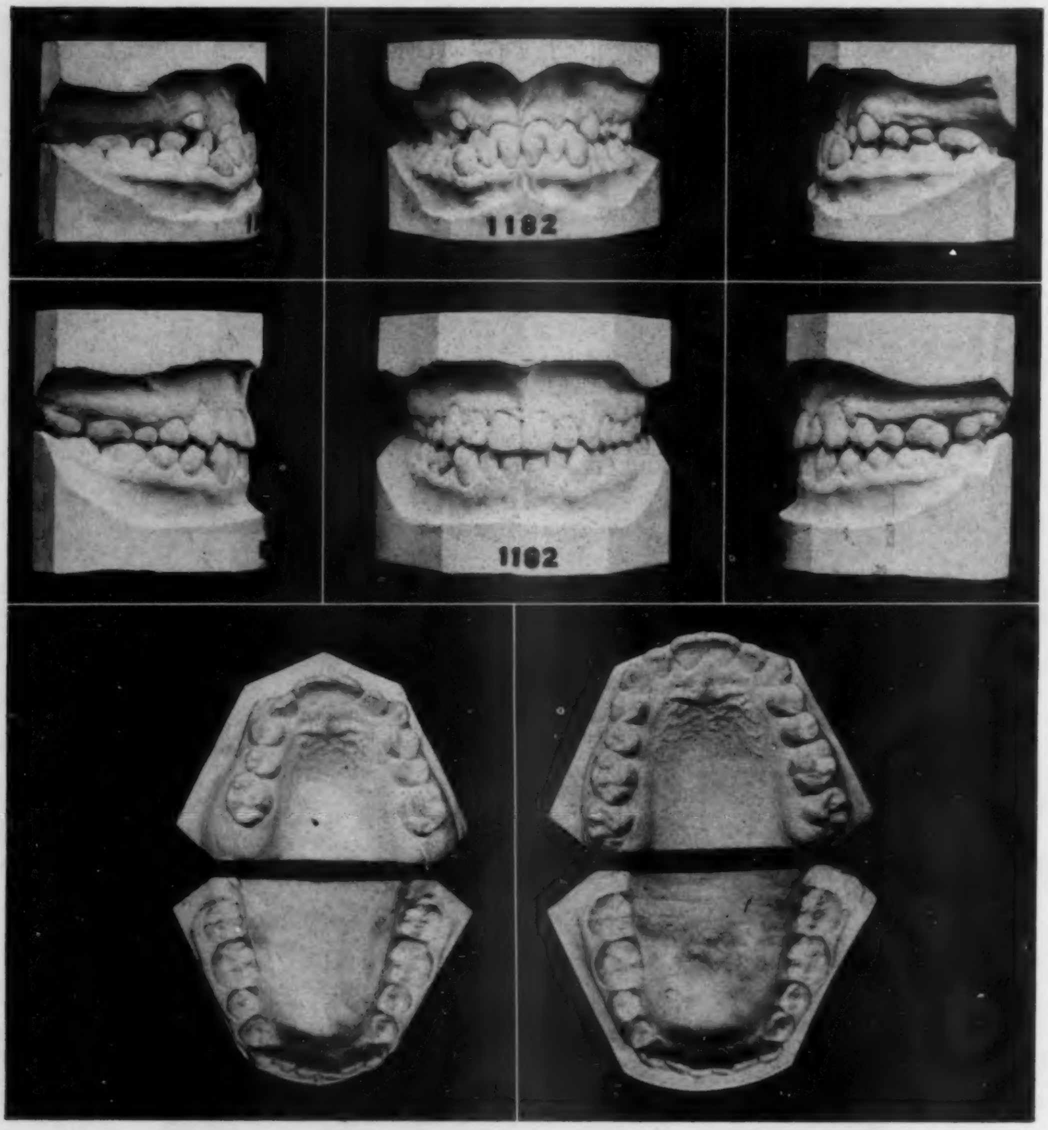

Fig. 3.—Case 1182. Before treatment and six months after removal of retention. Note amount that bite has opened and vertical positions of mandibular incisors in finished case.

to allow the teeth to settle down. Other appliances were then placed, and both maxillary and mandibular dental arches were lengthened. Class III intermaxillary elastics were worn intermittently. At the end of two years of active treatment, which included rest periods, appliances were removed and removable retaining plates were placed, which were worn for six months. At

that time, the mandibular left second molar erupted in linguoversion to the maxillary second molar. These teeth were banded and cross elastics were placed. The teeth crossed in about two months. The child went away and did not return to the office for eight months. She had not worn her retaining plates for the past six months when the second set of models was made. Thus, the retaining appliances were worn for only about nine months altogether. I saw the case two years later and the only change seemed to be a slight labial movement of the right mandibular cuspid. As I said before, extraction of four premolars was considered, and the over-all result might have been better, but in some respects I think it would have been worse.

The appliance used was as follows: on the maxillary arch the first molars and the four anterior teeth were banded, a removable lingual arch and a Johnson twin wire labial arch were placed. On the mandibular arch the first molars and the cuspids were banded and a Johnson twin wire labial arch was placed. This arch rested in the brackets on the cuspid bands and was ligated to the four mandibular incisors. On the end sections of this arch, sliding jigs were placed so that the force of the Class III intermaxillary elastics would be directed against the mandibular molars in an attempt to drive them distally. The maxillary lingual arch with auxiliary springs was used for expansion in the molar and premolar region. Coil springs were placed on the end sections of the maxillary twin wire arch to lengthen the arch and create space for the blocked-out cuspid.

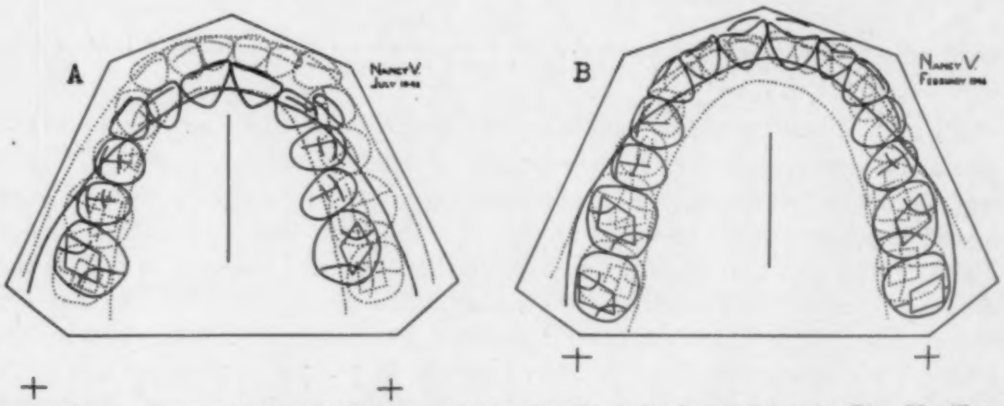

Fig. 4.—Survey of Case 1182 before treatment (*A*) and after treatment (*B*). Maxillary teeth and basal arch outline solid; mandibular teeth and basal arch outline dotted. Note change in relationship of maxillary and mandibular basal arch outlines.

Fig. 4 shows the maps of the case before and after treatment. On the left is the map of the original condition. The maxillary teeth are solid and the mandibular teeth are dotted. The maxillary basal arch outline falls well inside the mandibular basal arch outline, while in the normal case, these two lines coincided. This is partly due to a deficiency of the maxillary base in combination with an overdevelopment of the mandible, but it is principally due to a forward positioning of the mandible. The mandible is also thrown over toward the right. A study of the map on the right, which is a survey of the

case after treatment, reveals that the mandibular basal arch outline has moved about 5 mm. backward, which indicates the amount the mandible was being held forward by cuspal interference. In order to show the tooth movements which occurred, these maps were related by superimposing the maxillary basal arch outlines, the axes of symmetry of the maxillae, and also the median raphes. The axis of symmetry of the maxilla is an imaginary line which most nearly divides the maxillary basal arch into two equal halves. It is the sagittal plane of the denture. Sometimes this imaginary line coincides with the median raphe, but often it does not. An interesting study could be made of the reliability of the median raphe as a guide to lateral symmetry of the denture. However, the raphe, if clearly defined, provides a landmark for relating maps of cases before and after treatment.

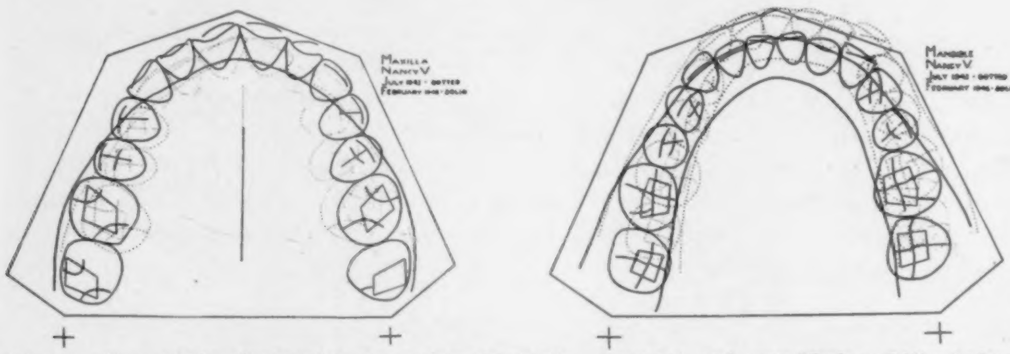

Fig. 5.—Case 1182. Composite maps showing tooth movement and mandibular shift; before treatment (dotted) and after treatment (solid).

Fig. 5 shows the actual maxillary and mandibular tooth movements. The maxillary dental arch has been expanded 6 mm. in the molar region and 5 mm. in the premolar region. The incisal edges of the maxillary incisors have moved forward 2 mm. It would appear that the basal arch had widened about 3 mm., but I am more inclined to believe this apparent increase is due to the fact that the surveys represent the apical third of the alveolus and not the apical base. The mandibular molars have been moved distally within the alveolus sufficiently to allow the right cuspid to assume a more normal position in the arch, but the principal movement has been a 5 mm. backward movement of the whole mandible. The mandible in moving back has also swung to the left and is now in a much more centric relationship with the maxilla. In other words, in the original condition the occlusal interference had forced the mandible to the right as well as forward.

This backward movement of the mandible is more easily demonstrated by related section maps made in the sagittal plane (Fig. 6). This composite map shows how the maxillary incisor was tipped forward, while the whole mandible moved backward 5 mm. Note the opening of the bite which was accomplished. This dropping back of the mandible is the evidence I referred to at the beginning concerning the possibility of repositioning the mandible by

means of a guide plane, which is really an artificially created occlusal interference. Such a plane could never be as effective in holding the lower jaw forward in centric occlusion as the upper teeth were in this case, and yet as soon as the interference was removed, the mandible dropped right back into normal centric relation. Bear in mind that this condition existed for a number of years, at least since the eruption of the permanent incisors, and probably ever since the eruption of the deciduous incisors. The parent thought that it had.

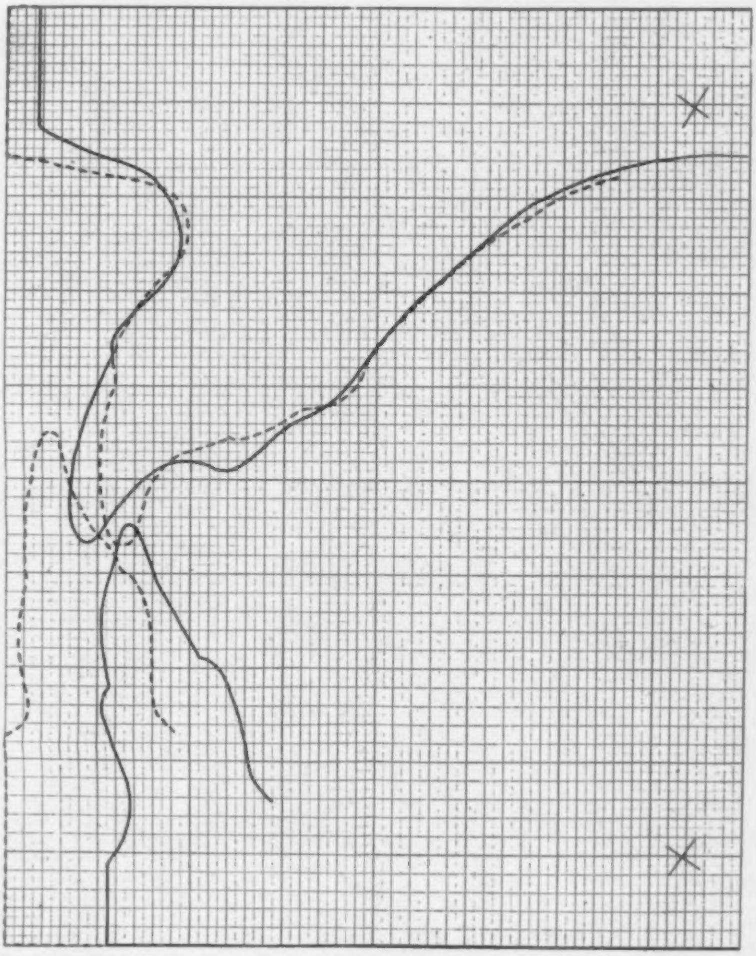

Fig. 6.—Composite map of Case 1182, before (------) and after treatment (———), showing forward movement of maxillary incisors and downward and backward movement of mandible.

Of course, it is possible that in centric relation with the teeth separated by freeway space, that is, with the mandible in rest position, the condyles may not have been held forward at all, which may have been a very important factor in the prevention of the establishment of false condylar positions. In any event, in this case very fortunately it was not possible to establish positions of the condyles anterior to their normal positions. However, I believe it is possible for a mandible to move forward if it has been held in a retruded posi-

tion by occlusal interference. This will serve as an introduction to the next case, which is one of Class II, Division 2 (Fig. 7) aged 7 years, 10 months when the first impressions were taken. I was undecided whether or not to start treatment at that time, but the parents definitely preferred to postpone treatment for several reasons, so my mind was made up for me. The second models were made after the eruption of the permanent teeth when the child

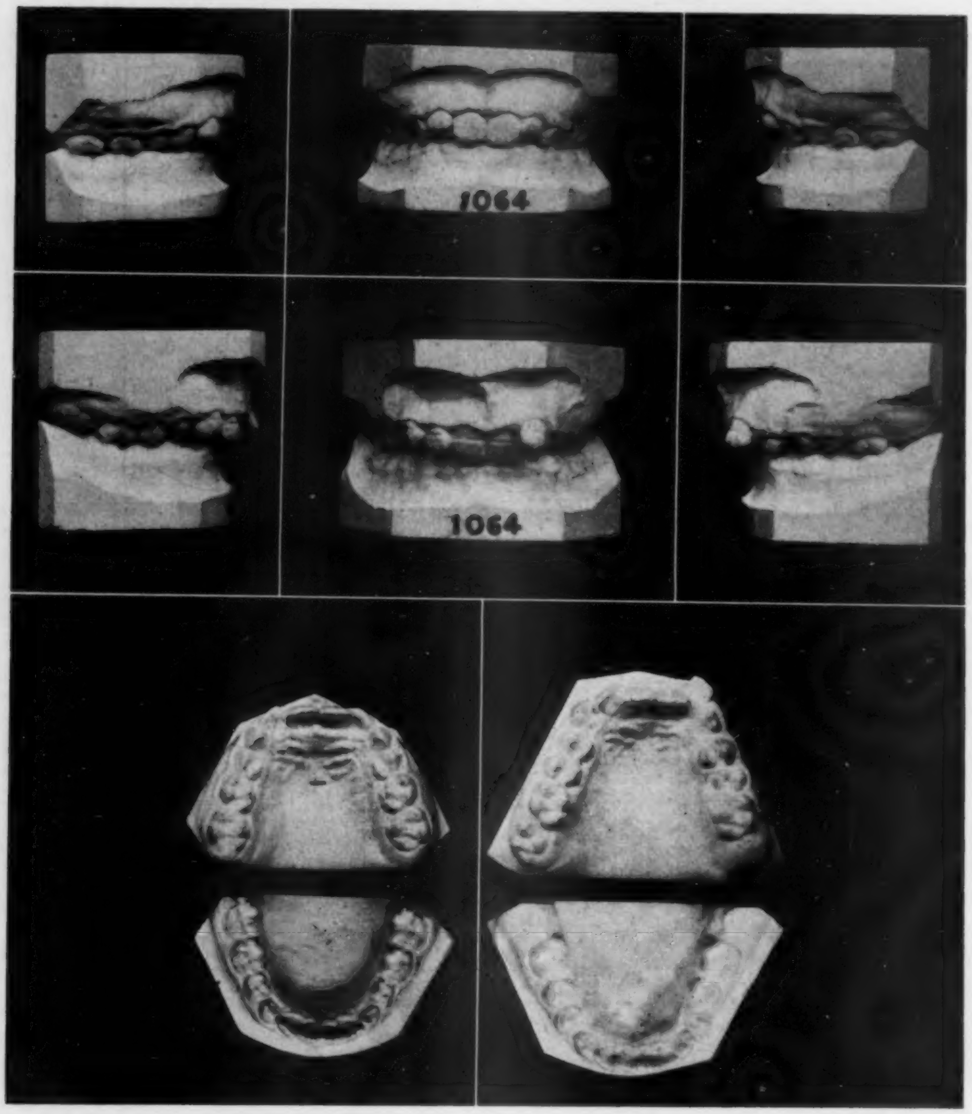

Fig. 7.—Case 1064. Class II, Division 2 (Angle). Mixed dentition and permanent dentition three years later. No treatment.

was 11 years old. The malocclusion has obviously become worse, evidently due to an imbalance of the surrounding musculature. The appliances used in treatment were as follows: the mandibular appliance consisted of bands on the first molars and cuspids, a lingual arch resting under lugs on the cuspid bands, and a twin wire labial arch clipped to the cuspid bands and ligated to the four

incisors. The maxillary appliance consisted of bands on the first molars and central incisors, a lingual arch with auxiliary springs, and a 0.036 labial arch resting in tie brackets on the central incisor bands. There were three light auxiliary springs soldered to this labial arch. One of these springs pressed inward on the left lateral incisor near the incisal edge; the other two pressed inward on the central incisors near the gum line. The object was to tip the crown of the lateral incisor lingually and to move the roots of the central incisors lingually. Inasmuch as the crowns of these teeth were ligated to a labial arch, the net result of this force was to change the axial inclinations of

Fig. 8.—Case 1064 after treatment. Note positions of maxillary second molars.

these teeth in a labial direction. In other words, I wanted to correct the lingual inclination of these teeth by a slight forward movement of the crowns, but more by a backward movement of the roots. The maxillary labial arch was adjusted to depress the central incisors at the same time. On the maxillary labial arch were hooks, not soldered to the arch but to small pieces of tubing which slid freely on the arch. Between these hooks and the buccal tubes on the molars were flexible tubes made from 0.010 inch wire closely coiled on a 0.036 inch core. In other words, they were not coil springs because the coils were not pulled apart. These tubes also moved freely on the labial arch. The object was to transmit all of the intermaxillary force on this arch

against the maxillary molars in the hope of moving them distally. After five months of treatment, the maxillary lingual arch was removed, and a removable guide plate was placed. This plate was worn with the intermaxillary elastics for about eight months. The maxillary incisors were then banded with Johnson twin wire bands, and a twin wire arch inserted. Treatment was continued for nine months more. Total time of active treatment was two years. Retaining plates were then placed. The case at the end of treatment is shown in Fig. 8. The maxillary retaining plate had springs soldered to the labial

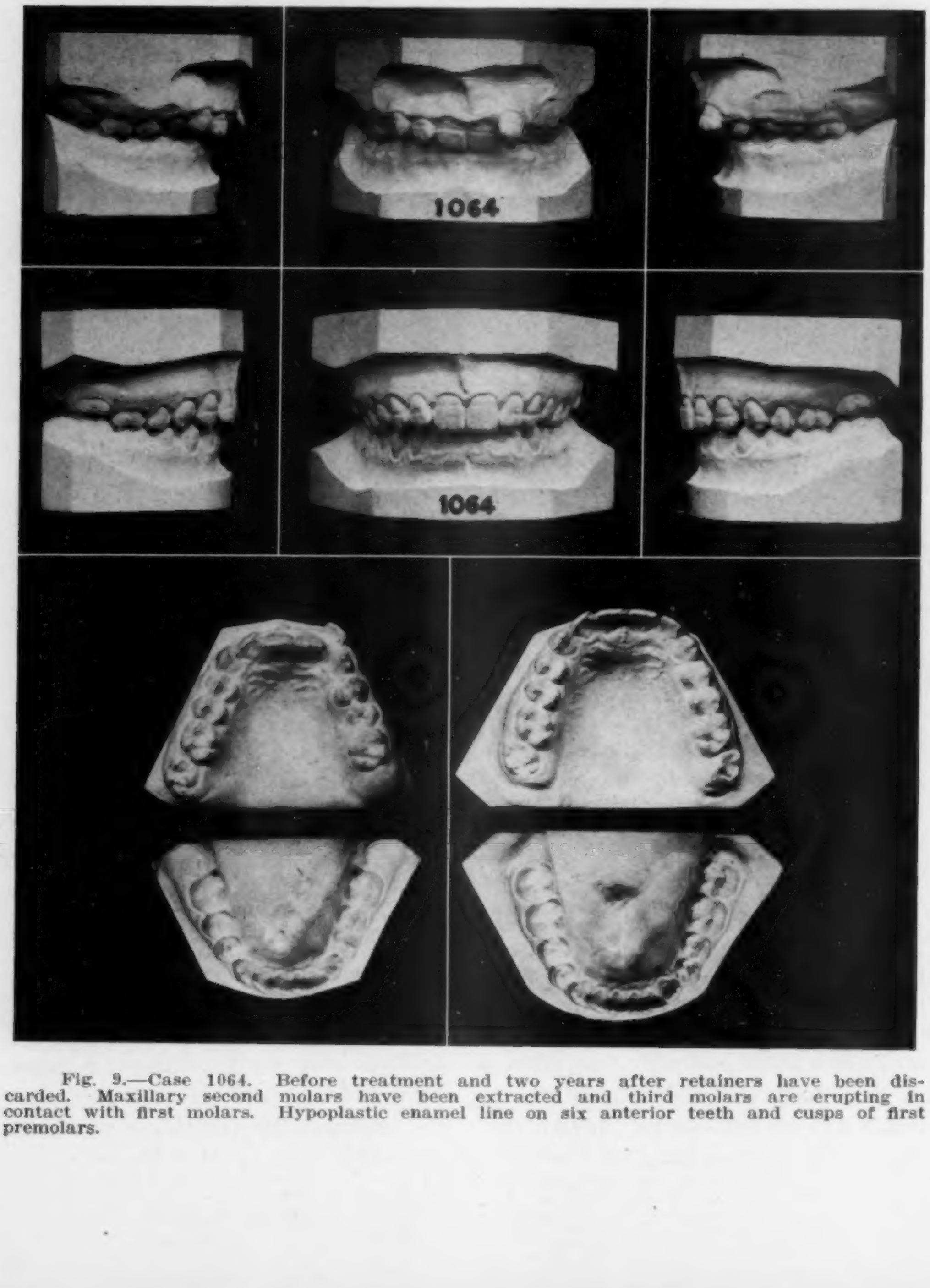

Fig. 9.—Case 1064. Before treatment and two years after retainers have been discarded. Maxillary second molars have been extracted and third molars are erupting in contact with first molars. Hypoplastic enamel line on six anterior teeth and cusps of first premolars.

wire to press inward on the second molars. Because of the extensive fillings in those teeth, it was later decided to extract them and allow the unerupted third molars to take their places. The last set of models compared with the models at the beginning of treatment (Fig. 9) shows the case two years after the retainers were discarded. The patient is 17 years old. The third molars

Fig. 10.—Case 1064 at beginning of treatment, left; completion of treatment, center; and four years later, right.

are not fully erupted, but are in better positions than the second molars were, and they are much more perfect teeth. The photographs at the beginning and end of the active treatment are shown in Fig. 10. What part of this facial change can be claimed as a result of orthodontic treatment is hard to say. I think that the removal of the occlusal interference may have allowed the growing child to achieve her optimum development.

An analysis of the various tooth movements which took place in producing this change follows. A comparison of the map of the mixed denture with that of the permanent denture before treatment is shown in Fig. 11. In comparing these maps,, notice that the maxillary basal arch outline remained about the same width, and the mandibular molars moved forward about 2.5 mm. following the loss of the deciduous side teeth. The maxillary molars moved forward also, which often occurs in the transition from mixed to permanent dentition. The roots of the maxillary incisors moved forward, increasing the lingual inclination of these teeth. The maxillary left lateral incisor has moved labially, the central incisors have moved over to the left, and the buccal teeth have moved forward. The loss of space for the lateral incisor is due more to the lateral shift of the central incisors and the mesial shift of the buccal teeth on the right side than to the mesial shift of the buccal teeth on the left side. The mandibular incisors are just where they were, but the basal arch outline of the mixed dentition is slightly forward of the same region three years later. Whether this is due to an actual shrinking in of this labial plate, as has been described by Atkinson,[3] or whether it represents an inaccuracy due to a compound impression, I am unprepared to say. It is definitely not a forward shift of the mandible, or the incisors would have moved forward also.

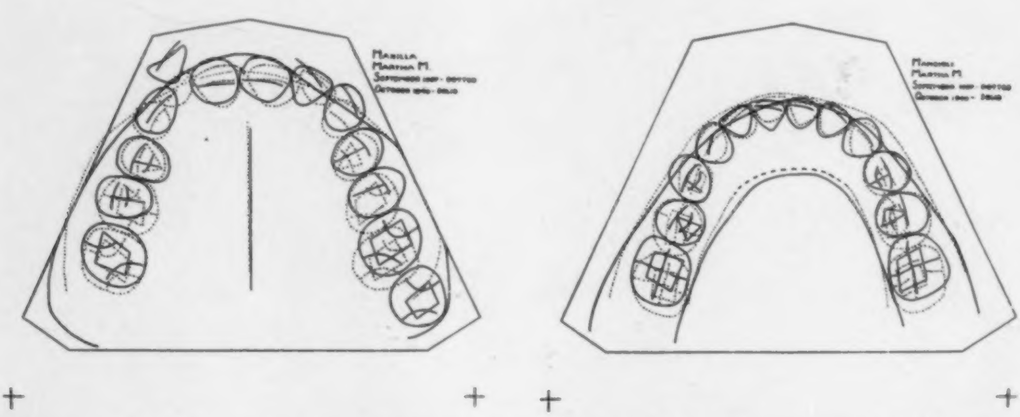

Fig. 11.—Case 1064. Composite maps of mixed dentition (dotted), and permanent dentition before treatment (solid). (See text.)

A comparison of the maps of the permanent dentition before treatment with its map several years after treatment is shown in Fig. 12. In the original condition, you will notice that the maxillary and mandibular basal arch outlines are quite normal in width, but that the mandibular bone line falls inside the maxillary bone line, not under it, as is true in all the normal occlusions which I have surveyed. This distal or posterior relationship of the mandibular basal arch outline to the maxillary basal arch outline always accompanies true distoclusion, although it does not accompany all cases in which there is a mesiodistal malrelationship of the buccal teeth. Combined with this distal relationship, I have noticed that children with Class II, Division 2 malocclusion have a tendency to hold their tongues in the vault in such a manner that when they

swallow, the vacuum created seems to have an inward pull on the crowns of the incisors. At the same time, the roots of these maxillary central incisors moved forward, increasing their lingual inclination, as is shown in this map.

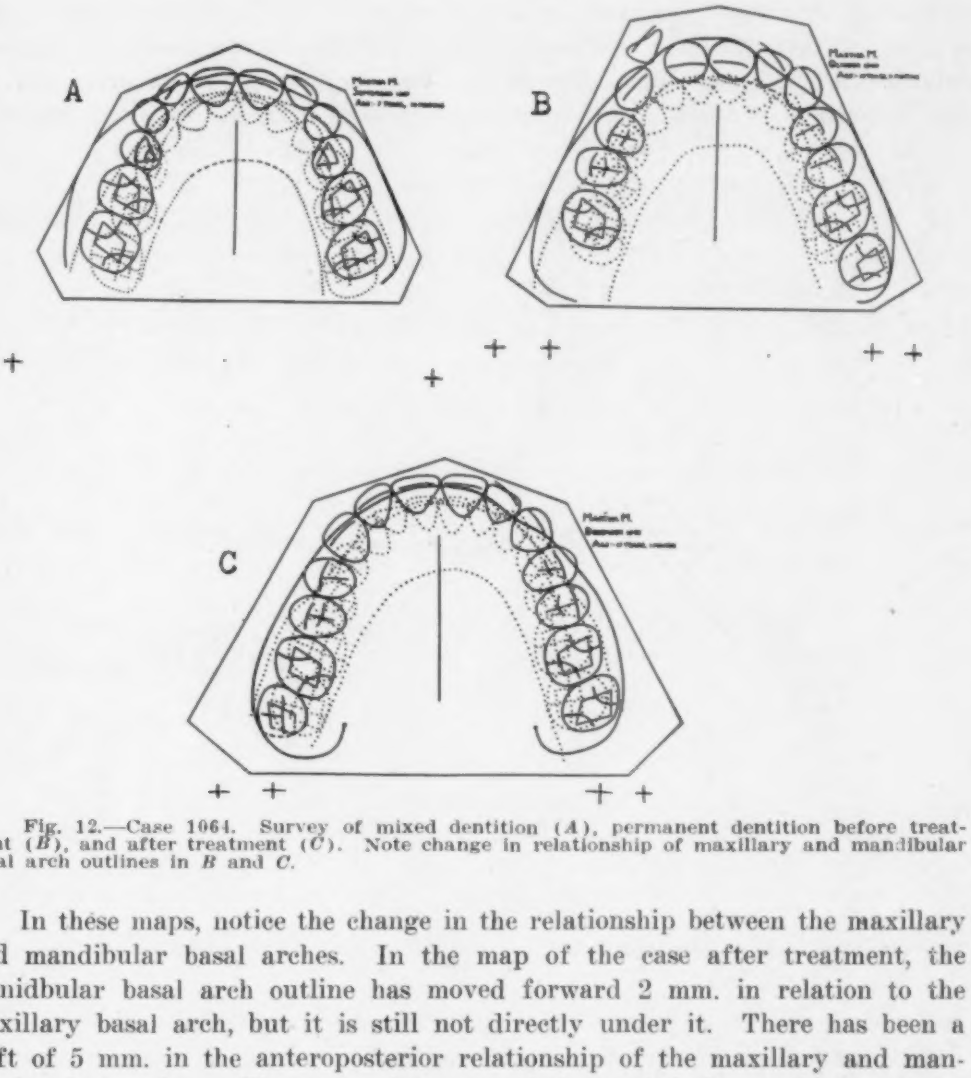

Fig. 12.—Case 1064. Survey of mixed dentition (*A*), permanent dentition before treatment (*B*), and after treatment (*C*). Note change in relationship of maxillary and mandibular basal arch outlines in *B* and *C*.

In these maps, notice the change in the relationship between the maxillary and mandibular basal arches. In the map of the case after treatment, the manidbular basal arch outline has moved forward 2 mm. in relation to the maxillary basal arch, but it is still not directly under it. There has been a shift of 5 mm. in the anteroposterior relationship of the maxillary and mandibular first molars. The composite maps of the teeth before and after treatment are shown in Fig. 13. There has been no increase in width in the maxillary basal arch, although there has been 6 mm. expansion in the coronal arch in the premolar region. The original maps from which all measurements were made are five diameter enlargements, and therefore the measurements can be quite accurate. Please bear in mind that there is more than seven years' difference in the age of the patient. Furthermore, we can see just what produced the 5 mm. shift in the mesiodistal relationship of the first molars. The maxillary first molars were moved distally about a millimeter. The mandibular molars were moved forward in the alveolus 2 mm., and the whole mandible

was moved forward 2 mm. I have seen this mandibular shift in the surveys of a number of my distoclusion cases, and in some of them it merely confirmed what I had observed in the mouth, namely, that the condyles were forward of their normal positions when the teeth were in occlusion. In such cases, as the mandible moves from rest position to occlusion, the condyles slide forward slightly on the eminentia in order for the mandibular teeth to occlude without interference with the maxillary teeth. But in the case here presented, at the conclusion of treatment there was no clinical evidence that the mandible

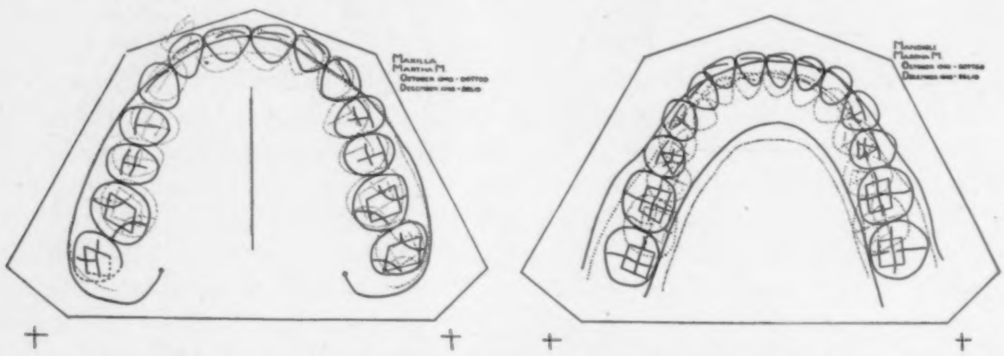

Fig. 13.—Case 1064. Composite maps showing tooth movement and mandibular shift. Before treatment (dotted) and after treatment (solid).

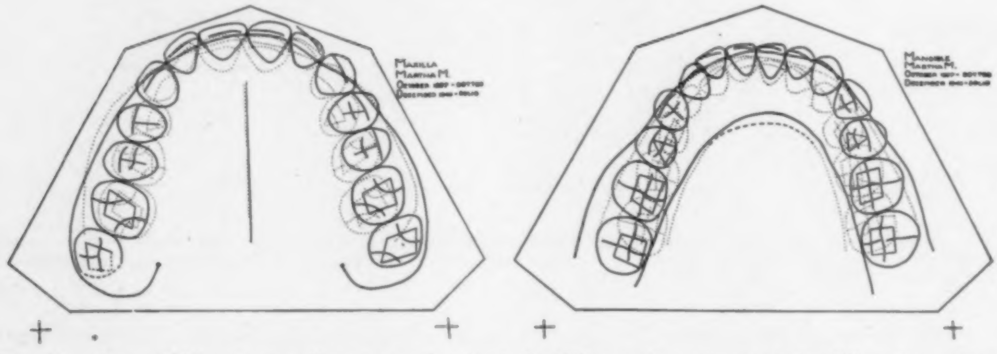

Fig. 14.—Case 1064. Composite maps of mixed dentition and permanent dentition ten years later.

was not in centric relation when the teeth were in occlusion. Have the condyles always been in a retruded position, and now with occlusal interferences removed, have they been brought up into their normal positions, or has there been a change in the necks of the condyles? Bear in mind that there was only a 2 mm. shift in the anteroposterior relationship of the maxillary and mandibular basal arches. The rest of the mesiodistal shift was of the teeth within the alveoli. Accurate profile x-rays with the mandible in physiologic rest position, as described by Thompson,[4] and x-rays of the temporomandibular joints before and after treatment would have been a valuable addition to this analysis.

A comparison of the mixed dentition with the permanent dentition after treatment, more than ten years later, is shown in Fig. 14. There has been

practically no lateral change in the maxillary basal arch. There has been a lengthening of the arch to accommodate the second molars, third molars in this case, as the second molars were extracted. The mandibular basal arch has moved forward, as was shown in Fig. 13. The axial inclination of the maxillary central incisors has been changed slightly. All the mandibular posterior teeth have moved forward in the alveolus.

And so we have the two cases, one in which the mandible has been held forward of its true centric occlusion for many years, but which dropped right back into true centric when the occlusal interferences were removed, and the other in which the mandible moved forward, apparently into true centric occlusion, when the occlusal interferences were removed. If any inference is to be drawn from these two cases, it could be that it is possible to reposition the mandible when, by the removal of occlusal interferences, the condyles are allowed to move backward or forward, as the case may be, from abnormal positions into normal positions.

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THE GROWTH OF CHILDREN—PSYCHOLOGICAL AND HEREDITARY FACTORS

BYRON O. HUGHES, PH.D.,* ANN ARBOR, MICH.

THE major task of adults who manage and guide children is to help them grow. To do this wisely so that growth is as luxuriant as possible rather than dwarfed and stunted requires understanding of the nature of growth and the conditions which influence it. The nature of growth as a process or processes is still one of the major problems of biology, and progress toward its solution is being made, even now, but slowly. It is in this area that hereditary factors appear to have most utility. The conditions which give nurture to the organism are better understood than the growth process, but much still remains to be accomplished before nurture may satisfactorily be supplied to fit the needs of the growing child. The major problem of child management is to recognize the amount and kind of nurture required, and to make provision of these nurtural materials at the time when they best fit the growth of the child. It becomes especially important then to point out the need for long-term planning, and the exceptional values of timing and pacing nurture with growth as we assume the responsibilities for the guidance and treatment of children.

The first psychological factor to be emphasized then is the development of an attitude on the part of the professional worker that will enable him to capitalize upon growth and heredity as he develops guidance policies and treatment plans. It may be unwise on my part to present to you the opinion that the orthodontic profession has some distance yet to go before it attains this attitude in a workable form. It still seems to me that a large number of orthodontists are more inclined to view a patient through the eyes of an appliance than they are to seek and utilize opportunities in growth and heredity for a more precise application of appliance skill. The way in which the extraction controversy is handled, with the creation of many issues and the solution of few problems, is suggestive. The striving for ideal occlusions irrespective of patients is indicative. And the viewing of an entire profession from within the narrowed walls of an appliance system on the part of some are but a few of many available examples. These serve not to provide opportunity for censure of orthodontists or orthodontics, but rather to reaffirm my belief that the development of an attitude more in keeping with basic biology will repay, with dividends, in a broader and more comprehensive access to knowledge and a greater facility in the treatment of individual cases.

A recognition of the significance of individual differences based on an understanding of what these differences are rather than on an awareness that they exist is the next psychological factor or attitude, in my opinion, to be developed by the individual who is charged with the effective administration

Presented at the Forty-fourth Annual Meeting of the American Association of Orthodontists, Columbus, Ohio, April 27, 1948.

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of nurture. If children were all alike, the setting up of formulas for wise nutrition, treatment, and guidance would be simple. However, children are characterized by a dramatic diversity. The measurement of every structure, of every physiological function, and of every achievement shows a large range. The response of different children to the same treatment is equally varied. A basic problem in nurture is whether to accept this diversity as an established fact, to understand it better and to work with it, or whether to ignore it or attempt to destroy it. Most evidence indicates the former to be true; many practice as though the latter were true. Since heredity and growth are two very important sources of individual differences, one cannot proceed very far unless he has accurate knowledge of these phenomena. Many people, professional and otherwise, are inclined to regard heredity with a considerable amount of suspicion. Certainly, these suspicions have justification in several instances since the claims for heredity range from the accurate and well-documented to the bizarre and fantastic. Unfortunately, more publicity has been given to erroneous and fantastic ideas than to useful and accurate conclusions. As a result, heredity has come to be regarded as a necessary but unimportant evil designed to produce a new person but subsequently having little to do with the way in which that person will live as he continues his life cycle—birth, puberty, maturity, senility, and death. Many believe that all of this is controlled by the environment and the nurture he receives from it.

There can be no doubt that success and well-being throughout life require excellence in environment and nurture, and, contrarily, there is no question that inadequacy in nurture and environment contributes markedly to injury, failure, and death. Fortunately the importance of excellence in nurture to welfare of life and the destructiveness of inadequacy and malnutrition to successful living have been widely recognized. As a result there has been much work done and our knowledge of nurture and environment has progressed rapidly. It is requisite that this continue.

It is an equally serious error to regard heredity as irrelevant and unimportant to living. No evidence indicates heredity to be more important than nurture and environment; emphatically no evidence indicates it to be less important. It is a major intellectual blunder that I must only condemn, to minimize the significance of one to demonstrate the importance of the other. Heredity and nurture always operate together; one without the other is devoid of meaning. When we talk about nurture we imply that heredity is using it. When we talk about heredity we imply nurture to be present to maintain it. When one or the other is absent there is no life. Each has implications for the other and the two interacting produce individual differences. These are as numerous as are the variations in environment and in inheritance. The rearing of children and the treatment of a malocclusion are forms of nurture and are provided by the environment in which a person lives. Heredity comes from parentage. A more constructive point of view for the orthodontist, who must work with individual differences, is recognition that heredity is a positive thing which enables one to capitalize more on the potentialities of the individual and thus enhance his opportunities for suc-

cessful treatment. *Knowledge* in general is useful and knowledge of heredity is no exception. Beliefs and ideals, however sincere their carriers, cannot be accepted as adequate substitutes for knowledge. Ignorance certainly is not useful, and in the field of the health sciences ignorance of heredity is productive of many errors, some of which not only are expensive but also are dangerous to the welfare of the patient. The fourth psychological factor I would stress for the professional worker then is the development of a more critical awareness of the importance of knowledge, irrespective of its source, as necessary to professional progress and to reduce, or avoid entirely, the emphasis on self and what I believe as reasonable adjuncts to progress. These latter operate to create issues and develop controversies that divide a profession into self-contained and somewhat smug camps which inhibit rather than stimulate the progress of the profession as a whole.

To me, then, a discussion of psychological factors must first deal with the attitudes of the professional worker. And, although the preceding is somewhat pointed toward this audience of orthodontists, I would change the wording but little if speaking to a group of parents or teachers.

In summary, four points have been considered. They are: (1) to capitalize on growth through the use of long-term planning and to give particular attention to timing and pacing; (2) to recognize more fully the significance of individual differences and to adapt treatment to these differences rather than the reverse; (3) to realize that heredity is a positive phenomenon which enables the worker to capitalize on the potentialities of the individual as he provides nurture or treatment; and (4) to develop a greater intellectual maturity with a consequent reduction of issue and controversy.

As we turn to psychological factors involved in the direct management of children, we may turn to an old commonplace for guidance. It is, "If the present is satisfactory the future will take care of itself." The child psychologist says it differently and in a more comprehensive framework when he advises that "A normal immaturity is the best guarantee of a normal maturity"—the meaning is about the same in each case and the implication is clear. We should expect children *to act and behave like children* in all situations. It is both unreasonable and undesirable to expect otherwise. A child has difficulty in acting like a child when placed in situations that are wholly adult. Such circumstances are likely to bore and to confuse the child with a development of resistance and a marked deterioration in behavior. From the practical point of view in orthodontics and children's dentistry this means that a much better consideration of children's interests needs to be given to the development of waiting rooms so that children will find more to interest and to enjoy. Most dental offices that I have examined are strongly adult-centered. Truly enough, the majority are pleasing to adults both in the office appointments and in the office conduct. However, and this is important, these adult-centered and adult-arranged offices often are frightening and depressing to young children. The child meets the dentist as an enemy rather than as a friend too many times. To begin in this fashion is not especially good if one wishes to obtain and use cooperation of the patient as a part of his

treatment planning. The general nature of the behavior that is provided for the orthodontist is developed by the earlier contacts which the child has with professional people in medicine and dentistry and the training received from parents and teachers. If they have done the job well the orthodontist is in an easy position. When the work has been poorly done the orthodontist needs to be especially careful in the way he handles the patient. He has to dispense with an already present fear and insecurity and substitute confidence and understanding and prepare the child for cooperation. The material equipment of any place will not, of course, solve all problems involved in the handling of children. The materials provided for the environment in which the child is placed can and should be interesting. When this is done, the personal handling of the child is always made easier; often when the environment does not give this, the personal handling of the child becomes exceptionally difficult. The advice is simple; practical difficulties in each office will necessarily limit the amount that can be done. In any case the orthodontist needs to realize that the provision of a friendly and interesting environment is the best ''letter of introduction'' to sound interpersonal relations and the cooperative carrying out of treatment.

The next factor is the foundational element of child psychology. Without it knowledge of child psychology becomes ineffective; with it one does not need to know much else. Just be friendly, first and all of the time in your attitude toward children, and second in the things you do with and for children. It is very difficult to commit an unfriendly act when you have a friendly attitude. It is almost impossible to appear friendly when your basic attitude is otherwise. And children are less easily fooled than adults. The psychologist advises, establish and maintain rapport. This means start friendly and keep friendly.

Security is a basic need for children. With security children can add social, psychological, and intellectual maturity as heredity and nutrition supply them with bodily growth. Without security the body alone grows and immaturity of behavior becomes characteristic. These individuals are problems to themselves and to others who have to work with them. Many have already been your patients and others will be. To summarize your difficulties with children of this type serves no useful purpose here. You probably can recall them all too easily. The orthodontist is not responsible for the many failures in child management which produce the insecure and maladjusted person. As a part of practice, he is occasionally required to work with them as patients. When this happens, the orthodontist makes material gain in his own work if he takes on some psychological responsibility, and makes contribution to the security and comfort of the child. The best way to do this is to be friendly.

Another suggestion is to remember that the child is the patient and that he is the one who needs to have understanding about why he is being subjected to a vast array of oral indignities. Unless he can comprehend that the orthodontist is doing work of direct benefit to his personal welfare, the child is likely to become uncooperative and resistant. Very simply, the child should

be given orthodontic education and understanding as he is given orthodontic treatment. The education does not need to be of high professional caliber, and the dosages should be small. Usually this can be done by giving the child an opportunity to ask some questions and then providing him with a few answers, simply and accurately given.

Climate has long been known to affect the growth and production of plants. Social climate, in the behavioral area, greatly modifies the psychological development of the child. When the social climate is good, the child thrives and his personality grows. He becomes receptive to and explorative in the universe in which he lives, and is easy to work with. When the social climate is poor, the personality becomes weak and stunted. The child rejects the social climate and the persons—usually adults—who created it. Children who are grown in this type of social climate reject adults and become uncooperative and very difficult to manage. They cry out for sunshine and food much the same as the plant by moving toward any source that will make the provision. The cries in the form of temper tantrums, destructive behavior, and fears are easy to recognize. The meaning is not so clear. We too often conclude they are seeking attention when all they request is decency in handling. Surely this is not too much for a child, or an adult for that matter, to ask for and to receive.

Authoritarian procedures tend to produce poor social climates. Here the child is excluded from the planning and is manipulated as though he were a lump of clay or some other nonliving substance. Assignments and commands are given, and personal criticism and force, if necessary, are techniques for control. The authority may be acting in good faith and attempting to do things for the good of the child. The trouble is that the youngster does not know it. The authoritarian expects to obtain respect and cooperation; he more frequently develops fear and disobedience.

Democratic practice gives much better social climate. Here children have opportunity to discuss purposes and to have some part in planning. Some provision permitting freedom of choice helps. The adult always functions as a mature person; he shares information and gives professional aid and encouragement; he avoids discipline and coercion. This type of social climate reduces insecurity and minimizes fear. In a healthy atmosphere of this kind, cooperation and understanding appear and flourish. The development and use of these assets are important in orthodontic practice.

This limited discussion serves as an introduction to child management and makes no further pretense. It appears fitting to summarize:

1. We should expect children to behave like children; this is difficult in situations wholly adult.
2. Environmental control reduces the difficulty of personal control of child behavior.
3. Be friendly and again, be friendly!
4. Provide a decent social climate to give integration rather than domination.

Inadequate management of babies is almost entirely responsible for the development of finger-sucking habits. From this point of view the etiology of distortions superimposed upon the developing dentition by the effects of this type of oral habit lies, to a considerable extent, in psychological factors. Before developing this thesis, it must be remembered that a finger-sucking habit does not always produce a distortion, and also that the amount and kind of distortion produced by the habit vary more according to the inheritance of the individual than they do in terms of the various sucking practices. Irrespective of this, two points become clear: (1) in the absence of sucking habits, sucking distortions do not appear; (2) although the amount of distortion provided varies from inconsequential to extreme, it is very seldom that any contribution is made to the occlusal welfare of the person and reasonably frequent that serious occlusal damage is done. The fact that some distortions are of minor order and others "self-correcting" does not alter other evidence that approximately 15 per cent become or should become orthodontic treatment cases. Too many professional people, especially some in the fields of medicine and child psychology, and I regret to say also in dentistry, have badly advised about finger-sucking and its probable effects. Such ill-founded complacency and poor professional advice merit severe reprimand, and I take full responsibility for making it here before this group.

The argument that children need finger-sucking for the solace and comfort it gives them is very tenuous in the light of evidence. They do need security and comfort but not from fingers. These items can and should be provided by an intelligent and adequate parentage. The prevention of finger-sucking habits is simple, easy, and, more important, can be a lot of fun for both the baby and the parent. A few simple things need to be done; the rest comes by itself.

The first of these is very easy—feed the child whenever he is hungry and let him eat as much as he wants. In other words, dispense with scheduling the day the child is born, and do not adopt routine practices until the child has had considerable social learning and enough maturity to understand their importance. This takes about three years at a minimum.

The second directive is as simple as the first, but appears to need a little down-to-earth elaboration. It is, do things the natural way. Let us for the moment take a look at the natural way of feeding, and develop a more comprehensive knowledge about that pectoral appendage of song and poetic fame known in the English language as the bosom or breast. In its natural state it is quite a complicated gadget that took nature over a half million years to engineer to its present state of perfection. Judging from the nature of the biologic machinery incorporated into the gadget, it looks very much as though breasts were basically and efficiently designed to feed babies. That they may also serve as arch supports to strapless evening gowns or as focal points for adult male speculation seem to be incidental permissions rather than a part of Nature's main proposal—for babies to chew on.

The importance of breast-feding is primarily psychological and secondarily nutritional. First of all, breast-feeding insures that the baby will

come into contact with his mother, since it is very difficult to place the baby and the breast in a crib while the mother goes elsewhere. A bottle not only enables the parent to be absent, but also is serving more and more as a guarantee that the child will be isolated. A bottle in itself cannot provide security, comfort, and social experience for the child; a mother can. Although breast-feeding insures the mother and child getting together, it does not insure intelligent behavior on the part of the mother apropos of what to do once the connection has been established. Many primitive mothers who are preliterate and have never had any special instruction in child psychology know exactly what to do. And, incidentally, very few primitive children develop finger-sucking habits, speech defects, and other types of behavior symptomatic of insecurity and maladjustment. The primitive mother gets the baby connected to the breast, holds it close to her bare skin—the temperature adjustment is ideal, and judging from the baby's reactions bare skin must feel good—she rubs him, pats him, fondles him, rocks him, talks and sings to him, is pleasant to him, and both baby and mother appear to have a lot of fun. Primitive mothers do this type of thing many times every day and keep it up until well after the child is able to walk. We call this type of business spoiling the child. It is spoiling the child right into a deep-seated security that later will enable him to meet the rigorous competition of living without becoming a neurotic in the process. It spoils the child away from finger-sucking, stuttering, masturbation, and bed-wetting. It spoils the child out of insecurity and fear and into a powerful recognition that he is wanted and that at least one adult is worth while. These things, ladies and gentlemen, cannot be purchased; *they can and should be given.* I repeat: a finger or a bottle, even though they give solace, cannot serve as substitutes for adequate parentage.

So far I have talked about women, breasts, and babies, indicating that the three can be mixed together to form a powerful functional unit. More can easily be added and the strength of the unit is increased. The child who has a good father in addition to having a good mother is much better off than the child who has only one parent. With your permission then I would like to talk to you, and in the same earthy fashion, about how "to make a mother out of the old man."

From an evolutionary point of view it becomes apparent that Nature did a rather poor job of supplying the male of the human species with any kind of a mammary apparatus that would do other than discourage a baby in his attempts to secure nutrition. However, and strangely enough this is important rather than silly, place a baby on a male chest and you will discover that the baby resorts to breast-seeking behavior and that he becomes annoyed at the size of the breast rather than at the sex of the bearer. There is a sound psychological principle which states that the use of seeking-behavior gives us easiest access to making proper nurtural provision to the organism. If a principle is any good it is excellent policy to use it—so, we have a father, no functional breasts, and a baby seeking a breast on the father with evidence of the baby becoming discouraged if a breast cannot be located. The

problem: supply the breast. Here Nature fails, so let civilization take over and find that a bottle does the job nicely. A bottle used as though it were a breast gives the baby access to two mothers. The advice to the second mother, then, is the same as the first.

The provision of two mothers to take over the responsibility of infant care, the dropping of schedules and substitution of nurture timed to fit self-selection, and the provision of a good social climate through the addition of holding, talking, and playing to feeding periods operate to produce basic security and comfort and to dispense with finger-sucking.

One additional item needs to be added to the early experience of the child in order finally to reduce finger habits to a minimum. This is the provision of early chewing and biting experience. The simplest way to do this, so far as I know, is to place a finger between the gum pads and move it around from one side of the arch to the other while the baby bites and chews. Apparently one of the reasons for finger-sucking lies in the failure to provide oral exercise and chewing experience at a time when the developing child is ready for this type of nurture.

When these simple things are done, there remains a small percentage of babies who still develop finger-sucking habits for reasons that we do not know at present.

The question of what to do about sucking habits once they have become established is an entirely different matter. I have some opinions about the subject which are backed by enough evidence to merit presenting them at this time for your consideration. First, the best way to break these habits is to prevent them by doing the things previously mentioned. Second, to recognize very clearly that once the habit has become established there is little to warrant the belief that it may easily be broken by psychological methods. A procedure which works with one child is completely ineffective with another and, so far as I know, it is impossible to give any set of directives with the assurance that if followed the habit will disappear. The contrary, according to my experience, is a more reliable expectancy, namely, that the habit is more likely to become worse rather than better if we attempt to break it by the usual practices which are recommended. In a nonexperimental test situation in which I kept a record of the age of the child at which the habit disappeared and compared the ages of those who had dispensed with the habit, without any guidance or interference about the matter from their parents, with those whose parents had actively and conscientiously attempted to break the habit, the results were clear-cut but contrary to what was expected. The former group gave up the sucking habits at the average age of 6.7 years, while the latter were broken at the average age of 8.1 years. In other words, the attempts to break the habits made them worse.

Although this evidence is not nearly as complete as I would prefer to have it and even though the generalization is rather weak, I hold that there is little sense in attempting to break the habit unless there is a very good reason why it should be done. Psychologically and sociologically speaking,

I cannot find any reasons that merit the efforts and skill it takes to break the practice. As an aside, and to keep the record straight, I have heard and read a considerable amount about finger-sucing giving solace, security, and comfort to children. This seems to be little other than some peculiar type of adult wishful thinking. There is no demonstration of the point, and all evidence I know indicates children to be better off socially and emotionally without the habit than they are with it. Otherwise, there is no strong indication that the social and psychological disadvantage is other than slight, and sufficient reason for breaking the habit is not usually found on these bases.

The very good reason for breaking oral habits are dental. In this area, neither you nor I have to resort to opinion as we develop the discussion. Let me emphasize by repetition: finger-sucking habits are seldom conducive to occlusal welfare, and in approximately 16 per cent of the habit cases the distortions are so pronounced and so little inclined to self-correction that orthodontic treatment is necessary if the distortion is to be remedied. Of special importance is the fact that eight out of every nine open-bite cases would not have the open-bite if not distorted into it by oral habits. Although the finger habits do not produce Class II malocclusions to any appreciable extent, the distortion provision of protrusion of the maxillary anteriors and retrusion of the mandibular anteriors does not do a Class II, Division 1 case any good. It is needless to point out here many other disturbances lying between the canine tips that are distortion consequences. It is sufficient to summarize that there are many good dental reasons for breaking oral habits. Thus, I hold that it is the responsibility of the dental profession to make the decisions concerning the desirability of breaking the habit or of informing the parents that continuance of the habit will not endanger the child's dental welfare. These decisions must be made on dental grounds if they are to be meaningful and useful. They cannot adequately be made by persons who do not have the professional training enabling them to observe carefully and the clinical experience necessary to arrive at judicious conclusions. The orthodontist is best equipped to do this at present; the children's dentist and general practitioner should become so equipped to a much higher degree. At any rate, the decisions should be made by the dental profession and not, as they most frequently are, by persons who seem to feel that sincerity of purpose is a respectable substitute for knowing something about wholly dental problems. Therefore I advise, if we want to know whether to break the habit or let it continue, ask the dentist. If he says "Yes," *break it;* if he says "No," *let it alone.*

I have only one additional suggestion to make at the moment but do not have the time to elaborate the reasons here. It is that the orthodontist using oral appliances can best do this type of work, and although the construction of appliances to do the work will require some technical consideration, I have no reason to believe that the orthodontist does not have more than enough mechanical skill to engineer the job well. In other words, if the orthodontist wants the job done *he* decides when and how and then does it *himself.*

RETENTION WITH A NEW TYPE OF RETAINER DESIGNED TO IMPROVE THE RETENTIVE QUALITIES OF THE RETAINER

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FROM the beginning of orthodontics to the present time, orthodontists have been faced with the primary problem of moving each dental unit to its proper position in the dental arch. The secondary problem, though often subjugated to an inferior role, has been to maintain these teeth in their new position with a retaining device.

Fortunately, treatment has been like an increment bone, built up layer upon layer, until today orthodontics has become almost an exact science, with its basic fundamentals changing very little in the past few years.

Although appliance mechanism has greatly improved since Dr. Angle[1] first introduced his E arch, our retaining devices have not gone through the gradual process of evolution with consequent improvement. The foremost thought of an orthodontist is to correct the malocclusion by placing the teeth into his concept of normal occlusion and then be confronted with the problem of retaining the individual dentures and their relation to each other. Much to his dismay, teeth which were well placed shifted, while others, supposedly less advantageously placed, improved with the passing years. Retainers succeeded in some mouths but failed in others. This brought many orthodontists back to treatment, as they suspected that improper placing of the teeth might have been responsible for relapse rather than the failure of different types of retainers and retaining methods used.

In recent years, Tweed,[2] Strang,[3] Nance,[4] and others realized that in many cases a full complement of teeth could not be placed in their correct positions and be maintained with our present methods of anchorage and mechanics. In patients with crowded arches, unless the first molars are tipped forward, space is gained only by expansion in all directions, or a ballooning out process of the teeth and alveolar processes which takes place bucally and labially without any change in the apical base.

In such cases relapse often occurred either while the retainers were being worn or after their removal, and it is doubtful if any retaining device could maintain them, if it were due to the incorrect placing for that individual, although many Negro and Semitic people have double protusions which seem to be normal.

The most recent innovation of note in the retentive stage of orthodontic treatment is the "tooth positioner" devised by Dr. Harold Kesling.[5] With the

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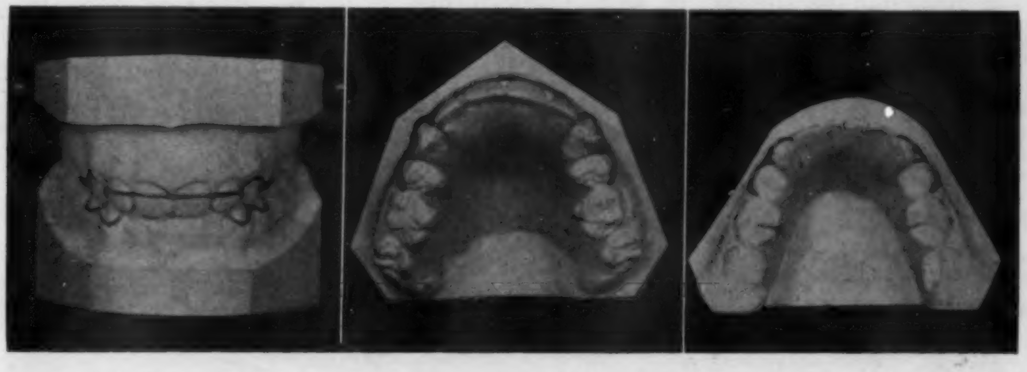
positioner, certain refinements of tooth movement can be manifested that were difficult to obtain during treatment and with the previous types of retentive devices, but the positioner itself has limited value in retention of correctly placed teeth, and is often followed by the conventional Hawley[6] retainer. As Dr. Kesling states, "Major tooth movements are completed when the teeth are properly rotated and approaching their normal axial inclinations and interdigitations. It seems entirely unnecessary to prolong conventional treatment after these positions have been accomplished. It is necessary however, in the case of extractions to parallel the roots of the teeth that are being moved into the space of an extracted tooth. If the positioner is worn as directed, slight rotations will be corrected, spaces will be reduced, and the arch form and axial positioning of the teeth will approach that of the predetermined pattern in three or four weeks' time. At this time it will be necessary to decide whether the patient is to wear the positioner as a retainer for a few weeks or whether it is a case that is going to require prolonged retention. If it is the latter a conventional type of retainer should be constructed, and coordinated with the positioner."

Judgment must be exercised in the placing of the Kesling positioner and should not be used in children having respiratory ailments such as allergies (Straub[7]) because in place the positioner blocks the passage of air through the mouth. Many children develop severe colds or have allergy attacks in which the nasal passages are almost completely blocked, and under these circumstances the child cannot wear the Kesling positioner and it is during these periods that the teeth relapse and it fails in its purpose.

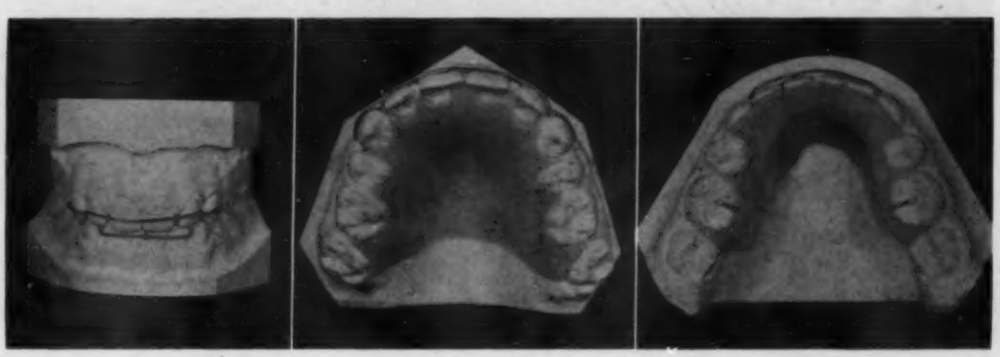
All types of fixed and removable retainers have been devised by orthodontists to maintain teeth in their new positions. The cuspid-to-cuspid retainer with a lingual wire soldered between the two bands cemented in place has limited virtue in stabilizing badly rotated mandibular cuspids; however, frequent visits by the patient are required during retention to recement cuspid bands, check for caries, or realign the lingual wire. The same disadvantages apply to the molar-to-molar lingual arch retainer, although it too has a limited value in some instances. A molar band may become battered and partially loosened, allowing food to pack between the tooth and the band, causing etchings or decay. Individual teeth banded with soldered spurs to hold rotations supplementing the retention with an acrylic plate carry the same dangers of etchings or caries from a loosened band, as the spurs also have a tendency to hold the food in apposition to the teeth, making it difficult for the child to keep the teeth clean. The tightening of the clasps on the Hawley type retainers to hold them in place sometimes activates the retainers until they themselves become an orthodontic appliance, either moving the retainer out of position or moving the teeth until the retainer no longer fits. Another disadvantage is that frequently the upper retainer drops out when jiggled by the patient's tongue. When labial wires are used, decided abrasive areas or grooves are often present in the enamel of the incisors, as a result of constant jiggling of the retainer by the patient's tongue.

Perhaps a great part of the unfortunate relapse encountered at times is due to the inefficiency of the retaining devices employed to hold the teeth until the bone rearranges its trabeculae and recalcifies itself with the teeth in their new position. The periodontal membrane must thin out and new and old fibers reattach to new bone and cementum, and the cementum that has been injured during trȩatment must be repaired (Oppenheim[8]). In order for this to take place without relapse, the teeth must be held in their new positions until it is accomplished.



A. B. C.

Fig. 1.—*A*, *B*, and *C*, The conventional type of Hawley retainer with modifications.



A. B. C.

Fig. 2.—*A*, *B*, and *C*, A type of retainer commonly used today.

There has long been a need for a retainer of simple design that would overcome most of these ills and accomplish the purpose for which the patient subjected himself to orthodontic treatment.

The retainer described herein is not the "cure all" for retention, but merely a step toward the solution of the problems faced when bands are removed from a correctly treated case.

There are certain qualifications that a good retainer should possess in order to serve its purpose efficiently. First of all, it should hold the teeth securely in their new position without tension, unless slight active movement is desired with auxiliary clasps or springs. Secondly, it should be a sturdy, well-construct-

ed appliance that is easily removed for cleaning by the patient, and it should be as inconspicuous as possible. Finally and probably the most important consideration is that the retainer should be designed to hold the teeth in the desired position and resist dislodgment by the patient's tongue. The retainer presented here can be used following most treatments, although designed on the treatment philosophy of Angle, Strang, Tweed, and others. It holds the teeth in place on the basal bones without adverse movement from clasps designed to hold the retainer in place, and yet when in place is not easily dislodged. It is similar in principle to the Akers and Roach theory of partial plate construction, snapping into place below the height of contour in a relaxed position, and when in place it is not easily dislodged.

Fig. 3, *A*. Fig. 3, *B*. Fig. 3, *C*.

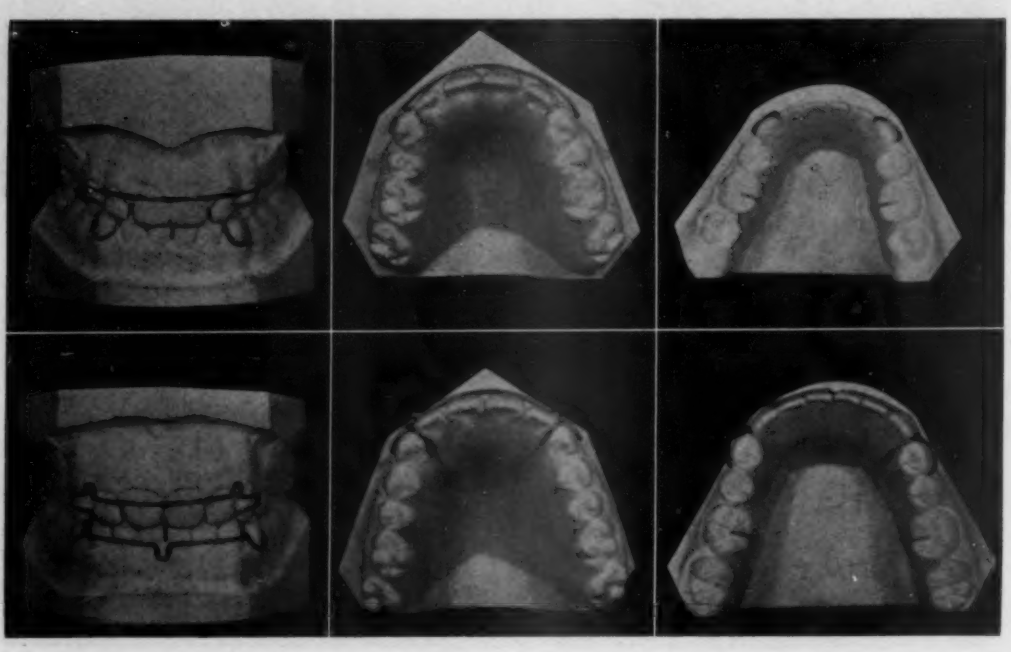


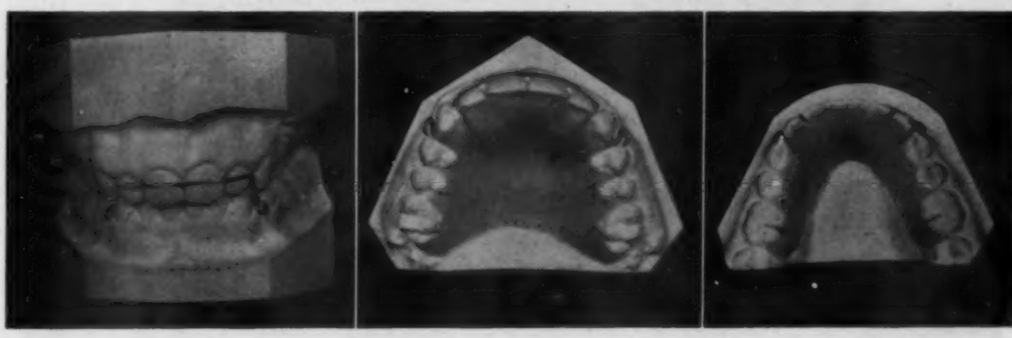
Fig. 4, *A*. Fig. 4, *B*. Fig. 4, *C*.

Fig. 3.—*A*, *B*, and *C*, Retainer developed for better stability. The clasp design on the lower retainer was designed to hold the lower in place. The open double clasp on the upper cuspid was designed to be above and below the height of contour of the cuspid to give better stability. The patients still jiggled the retainers.

Fig. 4.—*A*, *B*, and *C*, Retainer designed with a twofold purpose. Loops on upper labial wire could be contracted, closing the spaces between the upper incisor teeth. With open cuspid clasps, the labial wire could be adapted to give slight lingual pressure on the incisors. The lower had only one loop which was found to be sufficient and could also be used to close space between the lower incisors. These loops could also be contracted to tighten the labial wires for closer contact with the incisor teeth.

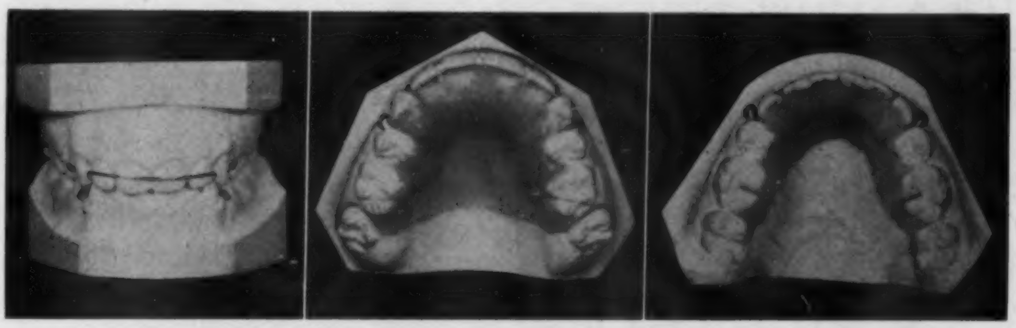
Many orthodontists have had the experience of lower retainers popping up continually and riding high from interference by the patient's tongue, permitting the teeth to shift and preventing the retainer from seating properly. Failure to seat properly has been responsible for relapses as the child may not appear for an adjustment until a month or two has elapsed.

Orthodontists prefer a retainer that is simple in design, easy to replace if lost, easy to remove, easy to keep clean, and yet one that is effective and esthetically inconspicuous so the patient will not object to wearing it. Over a period of years retainers have been designed and redesigned in trying to meet the previously mentioned specifications. Designs have been changed to meet what was thought to be special problems in treatment philosophy, but the same basic problem remained. Namely, too many wires were in contact with the teeth, creating a tooth-borne appliance, and adverse movement was obtained by tightening the loops or bends in the wire of retainers to gain stability.



A. *B.* *C.*

Fig. 5.—*A*, *B*, and *C*, A retainer of simple design that snaps into position over the height of contour and stays in place in a passive position. It can be activated by increasing the tension on the loop, exerting a slight distal pressure on the posterior teeth. The upper or lower retainers cannot be jiggled by the patient's tongue. Unsightly wires and bulk are eliminated. It is similar to the principle of the Akers and Roach theory of partial plate retention. Instead of a labial wire the lower has a hooklike rest that lies between the lateral incisor and cuspid which helps to support the retainer and maintains the incisors in contact with each other and holds the cuspid distally. It also may be slightly activated mesially or distally as desired.



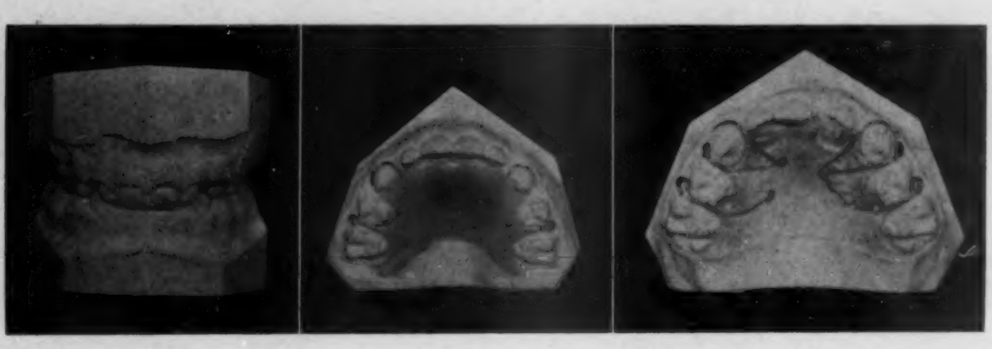
A. *B.* *C.*

Fig. 6.—*A*, *B*, and *C*, Modifications of the basic retainer shown in Fig. 5. *B* shows clasps added to guide the second molars lingually that have erupted buccally to their proper position. *C* illustrates distal extensions to exert slight buccal pressure on molars that erupted lingually to proper position.

The retainer shown in Fig. 4 has a desirable feature in that the space between the incisors can be closed. However, when the loop is contracted, the wire running between the cuspid and the lateral incisor has a tendency to ride high on the lingual surface of the lateral incisor, and in some cases has a tendency

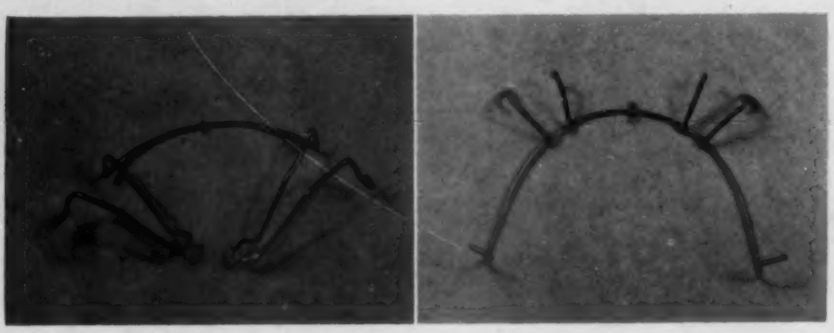
A. B.

Fig. 7.—*A* and *B*, Further modification on upper retainer shows tines to discourage the patient from thrusting the tongue between the anterior teeth in the perverted swallowing habit. *B* shows the added loop for additional stability of the upper due to added tines.



A. B. C.

Fig. 8.—*A*, *B*, and *C*, Application to deciduous and mixed denture cases after primary treatment. *B* shows the retainer in place. Notice clasp on cuspid to hold cuspid distally with loop placed against second deciduous molar for retention. Acrylic is removed from the lingual of the incisors to allow spacing, shedding, and eruption of permanent incisors. An adhesive powder is also recommended to hold the retainer in place in young children. *C* shows a modification of the retainer with additional loop for retention since one central incisor was lost due to pulp involvement. The absence of a labial wire is always indicated in deciduous cases.



A. B.

Fig. 9.—*A*, Frame of upper. *B*, Frame of lower.

to protrude slightly the lateral incisor labially, until finally this type of retention was eliminated. All these differences of design of retainers have their shortcomings and have failed more or less in their purpose. A retainer has been designed in which no clasps are used for retention and a loop substituted that lies over the tissue and contacts the tooth only below the height of contour.

All bulky types of clasps are eliminated. From an esthetic standpoint, the amount of wire showing is minimized. It is difficult for the patient to bend, break, or distort the wire.

The labial wire arrangement on the upper is designed to hold the four incisor teeth in contact and the cuspid distally. The retainer is held firmly in a relaxed position, allowing the teeth their individual movements and preventing constant movement by the patient's tongue. If desired, the loop can be expanded to exert distal force against the posterior teeth and tighten the contacts between bicuspids and molars which is sometimes desirable when all the teeth present, including the second molars, were banded. When distal movement has been successfully accomplished, this advantage can be maintained by applying constant distal pressure when the bands are first removed and retainers placed. This force dissipates itself in a short time as the teeth contact one another and move distally from the loop.

In four bicuspid extraction cases, the loop can be placed against the distal of the remaining bicuspid for retention. In this position the loop will help to keep the spaces closed.

On the lower there are few wires visible or in contact with the teeth. The retainer remains seated in a passive position making it difficult for the tongue to dislodge it. A hooklike rest lies between the lateral incisors and cuspids, helping to support the retainer and maintaining the incisors in contact with one another and holding the cuspids distally. The new design permits the retainer to be both tissue- and tooth-borne, gripping the teeth firmly without causing adverse force manifestations. This eliminates most of the slight relapses formerly due to retainers riding high.

CONSTRUCTION

In the construction of the retainer, a 0.028 inch soft steel wire is used for the labial wire of the upper, and the loops are made of high spring 0.030 inch stainless steel wire. The wire frame is adapted and fitted on the artificial stone model. On the lower retainer the labial wire, loops, and both posterior and anterior rests are made from high spring 0.030 inch stainless steel wire. All loops and rests are soldered to the lingual wire for maximum stability. To insure the greatest possible degree of accuracy, all soldering operations should be done on the model. All loops involved should have ends rounded and polished for apposition to the teeth. In deciduous or mixed dentition cases, smaller wires such as 0.020 or 0.022 inch may be used depending upon the case. Cases are flasked, trial packed, and finished in the usual manner with clear acrylic.

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ORAL AND ENVIRONMENTAL FACTORS AS ETIOLOGICAL FACTORS IN MALOCCLUSION OF THE TEETH

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A FEW years ago the assignment of the subject "Oral and Environmental Factors" in the etiology of malocclusion of the teeth would have received a warmer welcome from me than it does at present. It is more difficult now to explain the cause and sequence of events that lead to the existent problem of a given malocclusion; whereas, at one time this was not the case, and the first step in treatment was considered to be the elimination of the etiological factor. I confess that my current interest in etiology has become more academic or scientific in nature rather than clinical. This is not meant to imply that local factors are unimportant and can be discounted, or that the desire to understand the cause is in any way lessened, but in clinical practice, case analysis and treatment planning are paramount. Evaluation of the existent condition as seen in abnormalities of tooth size and position, arch form, and arch length, relations of the dentures to each other and to their respective "basal" bones, muscular balance and function, and finally deviation from normal function receive priority over subjective reasoning as to "how it all came about."

Probably no phase of orthodontics has been discussed more than etiology. For this reason, certain of the problems considered in this section of the symposium on the orthodontic patient may fall into the category of "rehash" of known facts. The only justification for the "rehash" may be that recent information has altered previously accepted interpretations.

The scope of oral and environmental factors is enlarged to include the direct impact of a disturbing factor or combination of factors upon any part or parts of the developing oral mechanism. The oral mechanism includes the teeth and their direct supporting tissues, the mandible and maxilla proper, temporomandibular articulation, and the associated musculature with its nerve and vascular supply. It is considered not only in its static state but also from the viewpoint of development and function. During growth the component parts are highly coordinated to produce an enlarging but relatively stable pattern. Brodie[1] and Broadbent[2] have shown ample evidence to substantiate this statement. Severe impacts of a local nature will alter the pattern in its entirety, and less severe impacts will alter parts such as the occlusion of the teeth without disturbing the over-all skeletal pattern. A series of cases will be shown to illustrate these situations best.

The significance of the condyle as a growth center has been emphasized notably by three authors. Brodie[1] explained that in order for the pattern of the

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head to be stable during growth the condyle must grow at a rate equal to the total of the four growth components that comprise the anterior part of the face, viz., the maxilla, maxillary alveolar process, mandibular alveolar process, and the mandible. Growth at the condyle moves the mandible away from the maxilla, thereby making space for the eruption of the teeth. Weinmann and Sicher[3] state, "The growth of the mandible is obviously closely correlated to that of the upper facial skeleton. The mechanism of mandibular growth, however, is entirely different from that of the maxillary part of the face. In the latter, the growth is primarily sutural, initiated by proliferation of connective tissue. In the mandible, however, the main growth center is the hyaline cartilage in its condyle."

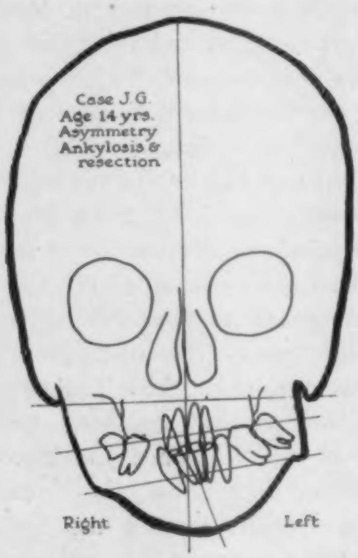


Fig. 1.—Facial asymmetry resulting from destruction of growth center at left mandibular condyle.

Destruction or retardation of the important condylar growth center, unilateral or bilateral, will result in progressive deformation of the growth pattern with secondary alteration in all parts of the oral mechanism. The severity of the facial asymmetry, if the affliction is unilateral, or the symmetrical deformity, if bilateral, is dependent on the age at which the growth center is affected. The earlier that it occurs, the more severe will be the deformity when growth of the other parts is completed.[4]

Fig. 1 is a tracing of a frontal cephalometric x-ray of a youth aged 16 years. The left temporomandibular articulation became ankylosed at 2½ years and it remained so for eleven years, until the condyle was resected. The cephalometric roentgenograms were made three years later.

The left mandibular ramus is much shorter than the right because of the destruction of the left condyle growth center. The ramus is but little longer than it was at 2½ years of age. Since that time, the normal growth of the right condyle has caused the chin to deviate progressively to the left. The

entire vertical growth of the left side of the face has been inhibited; consequently, the nasal floor, occlusal plane, and mandibular angle are at a higher level on the left side than on the right. The deviation of the facial midline to the left becomes more severe from above downward, because more components of growth are involved. The cranium is symmetrical as most of this growth was completed before the onset of ankylosis. The malocclusion, a Class II, is more severe on the left side. The occlusal plane is tipped and this type of case is usually complicated by the loss of one or more permanent molars. Orthodontic treatment is extremely difficult and there is much to be desired in the final result.

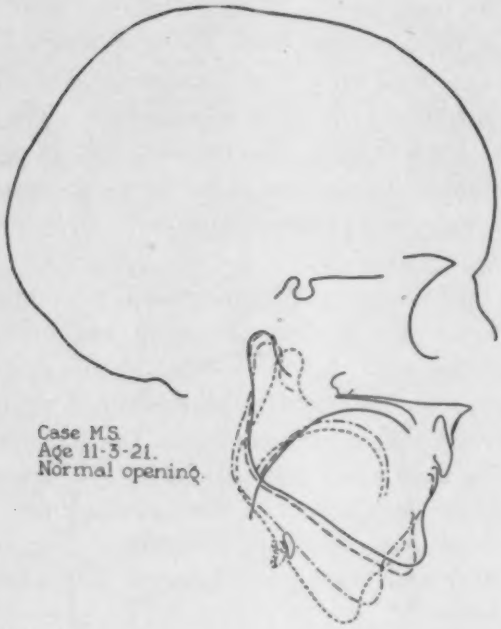
The restricted movement of the ankylosed joint and the removal of the left external pterygoid muscle from function has brought about functional changes in the musculature. In the normal opening of the mouth (Fig. 2), the external pterygoid muscle plays the major role in pulling the condyle downward and forward. As this muscle contracts, the masseter, internal pterygoid, and temporal muscles must relax proportionately. The suprahyoid muscles contract in order to allow the position of the hyoid bone to be maintained as the mouth opens. If the movement of the mandible is restricted by ankylosis, the suprahyoid and infrahyoid groups are brought into excessive function in the attempt to open the mouth.[5]

In this boy, the hyoid bone has been pulled well below the level of the chin by contraction of the infrahyoids (Fig. 3). This places the suprahyoid muscles in a position of mechanical advantage to open the mouth. This alteration of the normal muscle tensions exerted on the mandible may be a factor in the progressive change in the form of the mandible that occurs following the destruction of the condyle growth center.

Another example of injury to major growth centers is seen in the maxillae of severely mutilated cleft palate cases. The mutilation referred to is excessive and traumatic surgery. This problem is being investigated by Graber at the Department of Orthodontics, Northwestern University. The superimposed tracings of the lateral cephalometric x-rays, one with the mandible at rest position and the other with teeth in occlusion, reveal the marked deficiency in anteroposterior and vertical growth of the maxilla (Fig. 4). An intermaxillary clearance or "freeway space" of 20 mm. exists when the mandible is at rest position, whereas in the normal it is approximately 3 mm. This patient was subjected to fifteen operations in order to close the palate. It only accomplished the destruction of important growth centers in the maxilla.

Wylie and Elsasser at California and Brodie at Illinois have expressed similar views that malocclusion, and particularly Class II (Angle), is the result of a combination of disproportionate facial and cranial parts. Brodie has intimated that the area at fault in Class II malocclusion may be in the base of the cranium, but concerning variation he says, "One has only to study in detail any small part or organ of the human body to reach the conclusion that it exhibits wide ranges of variation in its form, reactions, and qualities. The

Fig. 2.



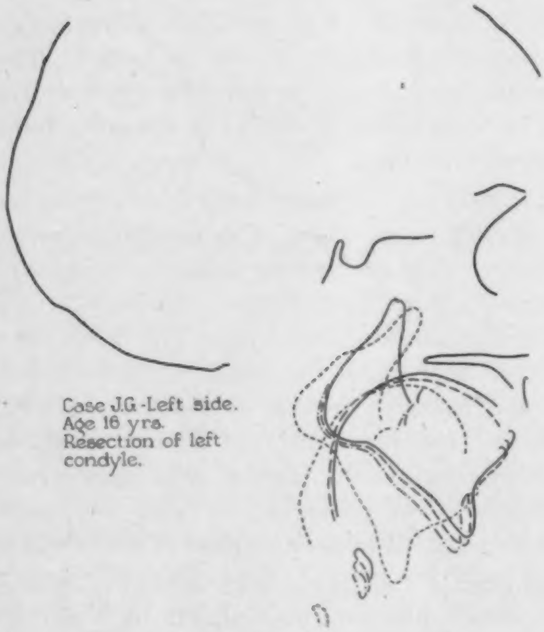


Fig. 3.

Fig. 2.—Superimposed tracings of cephalometric x-rays recording the normal opening movement of the mandible. Note relationship of hyoid bone to mandible as mouth opens.

Fig. 3.—Superimposed tracings of cephalometric x-rays recording the abnormal opening movement of the mandible in the boy shown in Fig. 1. Note relationship of the hyoid bone to the mandible as the mouth opens and compare with Fig. 2.

number of variants in even the smallest part seems endless and one can never be sure that he is dealing with a single characteristic and not with a combination. This being true, it should be apparent that any method of appraisal or diagnosis that is based on the acceptance of a norm which has been arrived at by grouping a series of untested variables must be highly unreliable.''[6]

Fig. 4.—Superimposed tracings of lateral cephalometric x-rays with the mandible at rest position and with the teeth in occlusion.

Wylie and Elsasser, using Broadbent's cephalometric roentgenographic technique, have measured the various component parts of the face and cranial base. They observed that each part in itself may be normal, but the combination of variable parts in the whole may be such that a malocclusion exists. One or more areas may be deficient, and it is possible that one deficiency may cancel out another. On the other hand, they emphasize that the combination of deficient parts may be such as to result in a more severe malocclusion. In a paper titled ''Malocclusion, Malady or Malformation,'' Wylie[7] condenses this view in these words: ''I see malocclusion as disproportion between facial parts —parts which in themselves may be within the limits of normal variation, but which are disproportionate when combined with other facial structure and lead therefore to a disproportionate whole.'' This is followed with the statement, ''The hypothesis is that nature has combined the parts of the face in a random fashion, with little regard for how well they go together, and that the efforts of orthodontists will be better rewarded if they are directed towards working out the best clinical procedures for dealing with accepted disproportions than if they are expended on speculation as to why disproportion is encountered in the face of man, when in truth infinite variety is a fundamental fact of nature.''

In accepting this view, one is not required to disregard the abnormal forces that are exerted upon the growing mechanism by oral and environ-

mental etiological factors, but only to reconsider his opinion as to the extent of the aberrations that they can produce. That they alone may bring about a Class II relationship of the mandible and maxilla in an otherwise normally growing organism is still an unsettled question.

Recently I had occasion to make a set of cephalometric x-rays of a patient of another orthodontist. The tracing is shown in Fig. 5. My immediate interpretation of the x-ray was that the malocclusion resulted from a growth disturbance—a very vague term in this instance—in the premaxillary and nasal areas. This was all well and good until I was informed that the patient, now 20 years of age, was still sucking his thumb. To say that the malocclusion (Fig. 6) is the result of thumb-sucking is associating cause and effect based on the concurrency of the habit and malocclusion. In this case, however, the circumstantial evidence is too strong to deny, and I accept the habit being one of the primary etiological factors. An inherent predisposition—again very abstract—may have been present to permit the environmental factor to affect such a modification of the facial pattern and occlusion that is present in this individual.

Fig. 5.—Tracings of lateral cephalometric x-ray of patient with Class II, Division 1 or Class I mutilated occlusion. Note the curvature of the nasal floor.

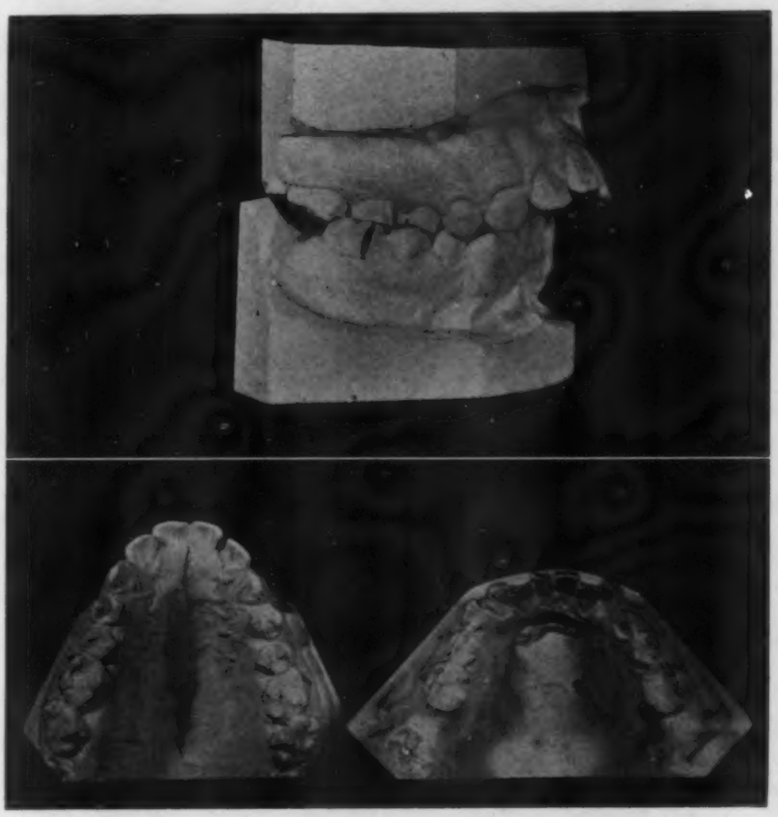
Thumb-sucking may produce other occlusal alterations. Fig. 7, *A* shows a Class I malocclusion with a cross-bite on the right side. The question may be asked, "How is it that an asymmetrical malocclusion can result from a habit that is exerting an abnormal force equally on both maxillary buccal segments?"

The explanation is clear when a more adequate means of evaluating the malocclusion is used. We have accepted for years that the occlusal relations of the teeth are indicative of the relationship of the mandible to the maxilla. Very often this is not the case. When this malocclusion is examined with the patient holding the mandible at its resting position (Fig. 7, *B*), the maxillary buccal cusps are directly over the mandibular buccal cusps. It is obvious that

there is a symmetrical narrowing of the maxillary arch, and in order to occlude these teeth with the normal mandibular denture the mandible must shift to the right or left, and the teeth occlude in the cross-bite relationship. Examining other malocclusions in this manner may help to differentiate between those that are of genetic and of environmental origin, but at the moment this is purely conjectural reasoning.

This method of analysis is referred to as the functional analysis of occlusion, and it is offered not as a substitute, but only as a supplement to the generally accepted methods in use today. I insert this consideration in a paper on etiology with apologies to the program committee, but do so with the conviction that we cannot evaluate etiology without examining the oral mechanism as it functions.

A.



B.

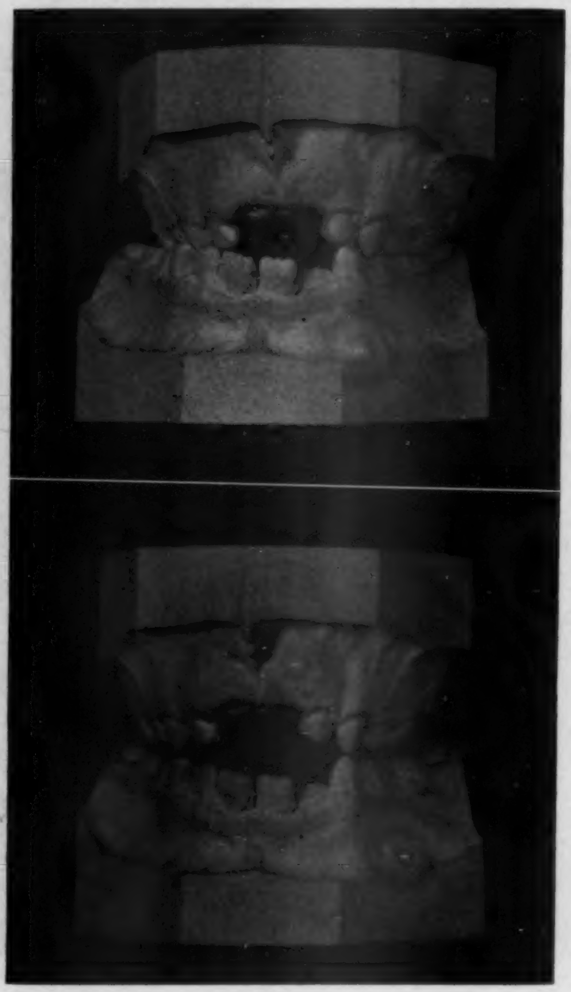
Fig. 6.—*A*, Lateral view of occlusion of patient shown in Fig. 5. *B*, Occlusal view.

Functional analysis of occlusion is based on the concept that the position of the mandible is established fundamentally by the musculature. Brodie[1] made the important observation in his cephalometric studies on growth of the head that the mandibular position is established before any of the teeth have erupted and is not altered by their eruption. Additional studies[8, 9] showed that it could not be altered permanently by prosthetic, operative, or

orthodontic procedures. This position, called rest position of the mandible, cannot be overlooked in the analysis and correction of malocclusion.

The two important phases of functional analysis are the size of the intermaxillary clearance or "freeway space" when the mandible is at rest position and the path of closure of the mandible from rest position to occlusion of the teeth. These, in the abnormal, are both illustrated in the following case.

A.



B.

Fig. 7.—*A*, Class I malocclusion with cross-bite on right side. Etiological factor is thumb-sucking. Note that the mandibular midline is deviated toward the right side. *B*, The same malocclusion examined with the mandible at rest position. Note that the midline is not deviated to the right side.

Fig. 8, *A* reveals the malocclusion to be characterized by a deep overbite when the teeth are in occlusion, but when the mandible is held at rest position (Fig. 8, *B*), a wide intermaxillary clearance, completely filled by the

tongue, is seen to exist. This indicates that there has been insufficient eruption of the posterior teeth, thereby necessitating overclosure of the mandible during function in order to occlude the teeth. Only the functional analysis of observing the patient with the mandible at rest position will reveal the true nature of the vertical discrepancy in the denture. Not only does overclosure exist when the teeth are occluded, but also the mandible is forced

A.

B.

C.

Fig. 8.—*A*, Malocclusion with deep overbite. *B*, The same malocclusion with the mandible at rest position reveals a wide freeway space between the maxillary and mandibular teeth. *C*, Bite plate in position.

posteriorly (Fig. 9, *A* and *B*). The photographs (Fig. 10, *A* and *B*) were not of the individual before and after treatment, but they were both made within a few seconds of each other. In Fig. 10, *B* the teeth are in occlusion, and in Fig. 10, *A* the mandible is at rest position.

The first step in the treatment is to eliminate the functional overclosure, and this is accomplished by placing a bite plate (the type designed by Sved is shown in Fig. 8, *C*) to permit eruption of the posterior teeth. The response to the bite plate treatment is shown in Fig. 9, *C*. The mandible is maintaining a more forward position as the functional posterior displacement is eliminated as the freeway space is reduced.

A.

B.

C.

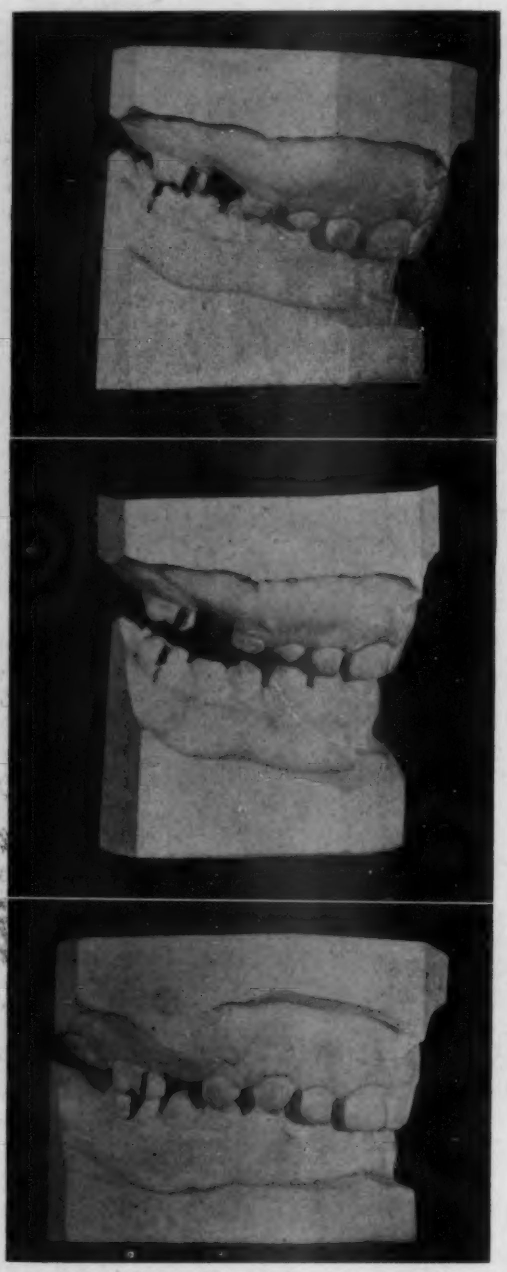
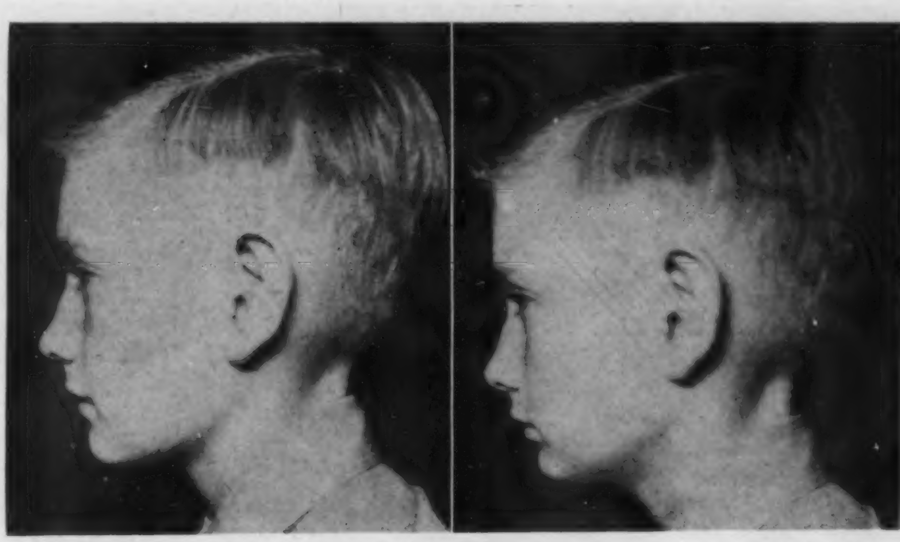


Fig. 9.—*A*, Models of patient shown in Fig. 8. Deep overbite and Class II relationship are evident. *B*, Models related with the mandible at rest position. The Class II relationship is decreased. *C*, Change in mandibular position with teeth in occlusion that occurred in six months with bite plate appliance. Case is now ready for fixed appliances.

The inadequacy of interpreting facial growth from photographs or, for that matter, had x-rays only with teeth in occlusion is apparent. We are very often dealing with mandibular position rather than growth deficiency. Photographs of a patient with mandibular overclosure and forward displacement are shown in Fig. 11. The apparent lack of maxillary growth and/or overgrowth of the mandible suggested in Fig. 11, *A* are not seen in the well-balanced face that actually exists when the mandible is at rest position (Fig. 11, *B*).

The investigations on mandibular position were started at the University of Illinois in 1940 as an outgrowth of Brodie's growth studies, and they are being continued at Northwestern University. I will briefly refer to mandibular position and movement and attempt to correlate them with functional etiology.



A. *B.*

Fig. 10.—*A*, Photograph taken with the mandible at rest position. *B*, Photograph of patient shown in Figs. 8 and 9 taken with teeth in occlusion.

All functional movements of the mandible begin from rest position where the musculature is in equilibrium, and the mandible returns to this position after function. When the mandible is at rest position, a freeway space of 2, 3, or more millimeters exists between the maxillary and the mandibular teeth. The size of this space varies with the individual and the condition of the occlusion. When the teeth are in occlusion, the mandible occupies a position dictated solely by the interlocking of the inclined planes of the teeth.

The normal movement of the mandible from rest to centric occlusion is almost a hinge movement with the axis located in the vicinity of the condyle. The mandibular incisors and the chin point swing upward and forward. The molars move on a similar but smaller arc since they are nearer to the axis. It is important to note that there is slight if any bodily movement of the condyle. Slight movement could still be considered to be within the normal range.

Since the rest position is quite stable and since the normal path of occlusion is known, these can be used as a diagnostic aid for determining normal and abnormal mandibular position when the teeth are in occlusion. The Broadbent-Bolton cephalometer offers a convenient method of recording roentgenographically any deviations from the normal path, thus indicating displacement of the mandible. Deviations from the normal path can also be noted clinically by careful observation of the patient, and it is not necessary to make cephalometric x-rays other than to record the displacement. A clue to the presence of abnormal mandibular position is an abnormal pattern of attrition. Figs. 12 and 13 represent the superimposed tracings of individuals with normal occlusions each showing normal paths of closure.

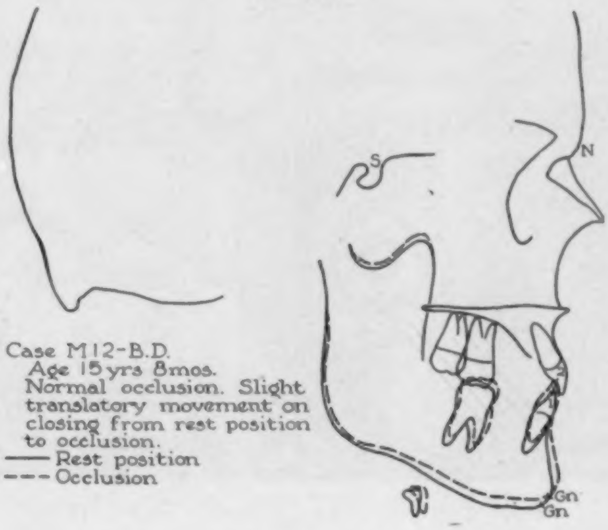
A. *B.*

Fig. 11.—*A*, Patient with forward displacement and overclosure of mandible with teeth in occlusion. *B*, Patient with mandible at rest position.

The normal path of closure is not confined to normal occlusion, and its presence or absence is a significant feature in the analysis, classification, and treatment plan for malocclusion of the teeth. The next two cases (Figs. 14 and 15) are Class II, Division 1 malocclusions, and it is important to observe that the mandible is in a Class II relationship at rest position as well as when the teeth are in occlusion. These cases exhibit a normal path of closure, and this indicates that the condyle is in its normal position in the mandibular fossa. In such cases the mandible cannot be repositioned anteriorly.

Recently this problem was restudied with an accurate temporomandibular articulation x-ray technique by Vernon Boman[11] and Dayton Blume[10] in the Department of Orthodontics at Northwestern University Dental School. Using the Lindblom[12] technique (Fig. 16), temporomandibular joint x-rays taken at rest position and with the teeth in occlusion were made in addition to the usual cephalometric x-rays on two groups of children. One was the control group and consisted of 25 individuals with excellent occlusicn. The other was comprised of 21 children who exhibited typical Class II, Division

Fig. 12.



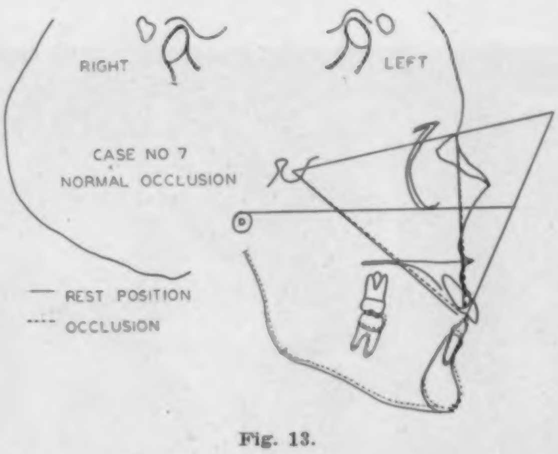


Fig. 13.

Fig. 12.—Superimposed tracings of cephalometric x-rays with the mandible at rest position and with the teeth in occlusion. This represents the normal path of closure from rest position to occlusion.

Fig. 13.—Normal path of closure from rest position of the mandible to occlusion of the teeth.

Fig. 14, *A*. Fig. 14, *B*.

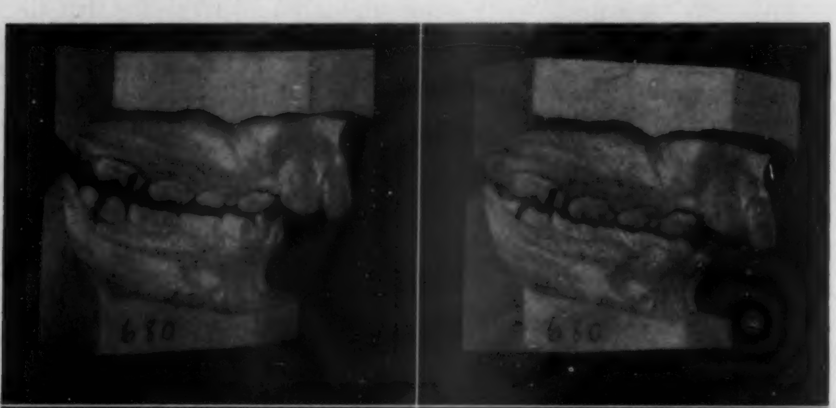


Fig. 15, *A*. Fig. 15, *B*.

Fig. 14.—*A*, Casts related at the mandibular rest position. *B*, Casts with teeth in occlusion. Note that the Class II relation is present at rest position and with teeth in occlusion.

Fig. 15.—*A*, Casts related at the mandibular rest position. *B*, Casts with teeth in occlusion. Normal path of closure (as in Fig. 14) from rest position to occlusion.

Fig. 16.—Lindblom orienting device for temporomandibular articulation x-rays.

1 (Angle) malocclusions when examined with the teeth in occlusion. The paths of closure in the normal group approximated an almost hinge movement with the axis located in the vicinity of the condyle. The composite of the temporomandibular joint x-rays is shown in Fig. 17. The paths of closure of the malocclusion group (Fig. 18) varied from the normal closure on some to extreme posterosuperior displacement of the mandible on others. Seven appeared to have a normal path of closure, and those exhibited a Class II tooth relation at rest position as well as when the teeth were in occlusion. They are true Class II malocclusion, and the etiology may be in genetics or at least a disproportion of parts referred to by Wylie, Elsasser, and Brodie. The remaining fourteen showed displacement in varying degrees so that at rest position the case might be said to be a full Class I or partial Class I in varying degrees. Conjectural reasoning suggests that local factors may be at least partially responsible for these malocclusions. In cases 5 and 2 the condyle appears to be in partial protrusion at rest position. These cases are not clearly understood at present, but the records were repeated two or three times in order to check the accuracy of the rest position. It was the same on each occasion.

The displacement that occurs in a large percentage of cases of this type of malocclusion (Class II) probably explains the difference in clinical response that has always been observed by practicing orthodontists and often attributed to growth, types of appliances, and particular methods of treatment. Certainly, the true Class II malocclusion (normal path of closure from rest position to occlusion) will not respond as rapidly as one that exhibits a considerable amount of displacement. They are not identical cases and they require different treatment. *Again, only a functional analysis will reveal the true nature of the malocclusion.* Furthermore, the entire concept of the changes that supposedly occur in the temporomandibular articulation as a result of orthodontic therapy must be reconsidered in the light of these findings concerning the position of the mandible.

To apply all this to etiology, or, rather than "place the cart before the horse," apply etiology to functional mandibular position, we must consider the possibility of abnormal oral and environmental factors affecting the positions of the teeth to the extent that the mandible is displaced into an abnormal relationship with the maxilla. Lateral shift was shown to occur as a result of a thumb-sucking habit. If this is possible, and since we have long recognized forward shift of the mandible to clear lingually occluding maxillary incisors, is it not just as feasible for the mandible to be forced into a distal position during function in order to occlude a normal mandibular denture with a narrowed maxillary denture? We have all experienced repositioning of the mandible in rapid correction of a Class II relationship that followed expansion of the maxillary arch. Actually, the mandible has not been repositioned but the displacement that occurred when the teeth were occluded was eliminated. The rest position relation of the mandible is not altered but the path of closure is changed from an abnormal upward and

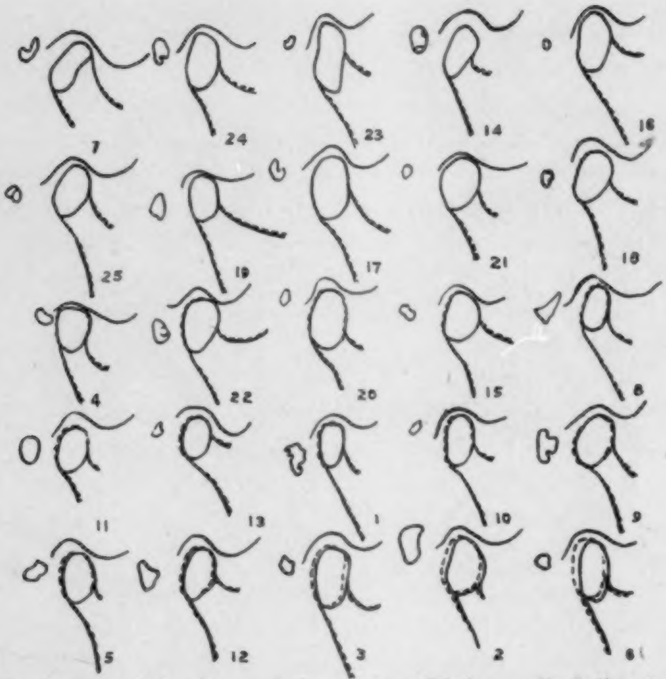


Fig. 17.—Composite of tracings of temporomandibular articulation x-rays made at the mandibular rest position and with teeth in occlusion in cases of excellent occlusion. ———— Rest position; - - - - - - - occlusion.

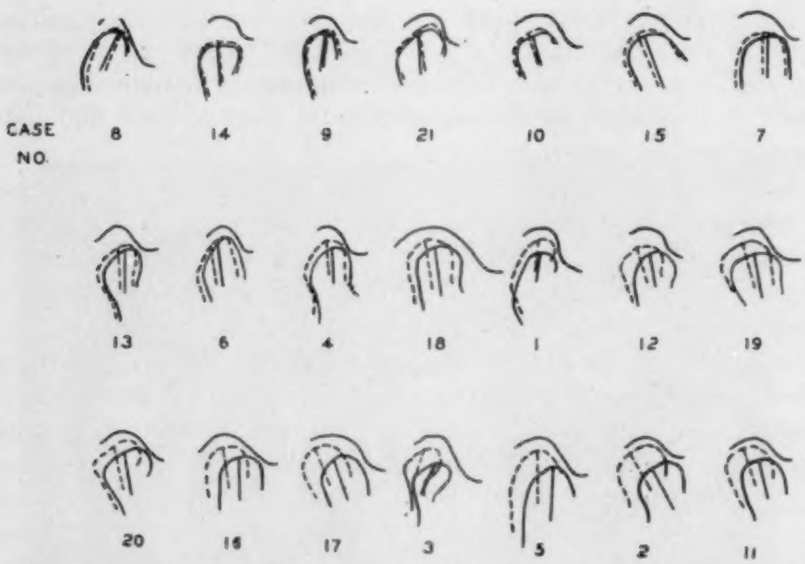


Fig. 18.—Composite of tracings of temporomandibular articulation x-rays made at the mandibular rest position and with teeth in occlusion in cases of Class II, Division 1 malocclusion. ———— Rest position; - - - - - - - occlusion.

backward path to the normal by eliminating the points of occlusal interference.

Such changes occur not only coincident with expansion or alignment of the anterior teeth, but also under the influence of a bite plate that permits eruption of the posterior teeth (Fig. 19). The Class II occlusion was reduced in its severity only by the wearing of an anterior bite plate. The mandible

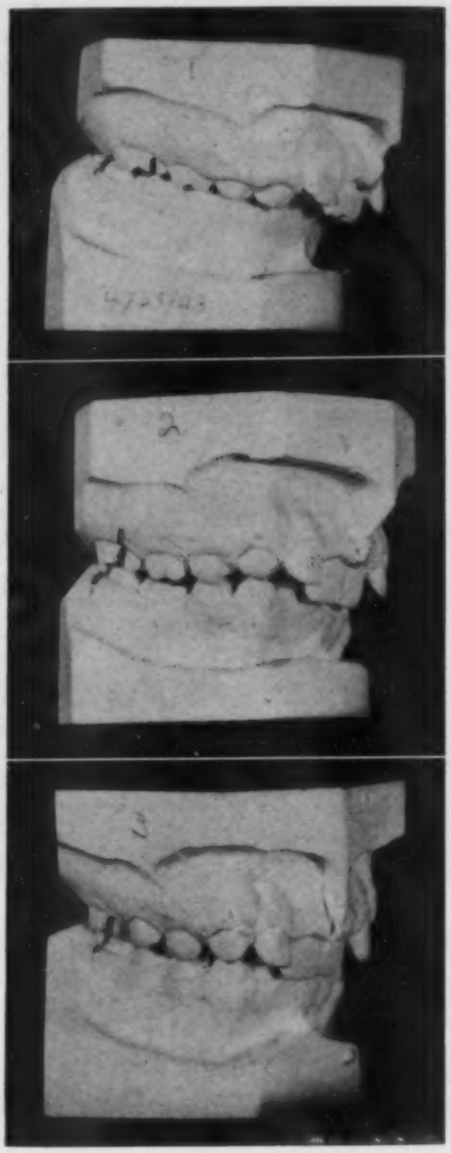


Fig. 19.

Fig. 20.

Fig. 19.—Models of a Class II, Division 2 malocclusion in which the Class II relation was reduced to a cusp-to-cusp relation by wearing a bite plate.

Fig. 20.—Superimposed tracings of cephalometric x-rays made with the mandible at rest position and with teeth in occlusion of case shown in Fig. 19. Posterosuperior mandibular displacement occurs when the teeth are occluded.

was not repositioned but rather the displacement was eliminated. The tracings of the original lateral head x-rays show that a posterosuperior mandibular displacement had been present (Fig. 20). Only those Class II cases exhibiting mandibular displacement will respond to this treatment.

Fig. 21, *A*.

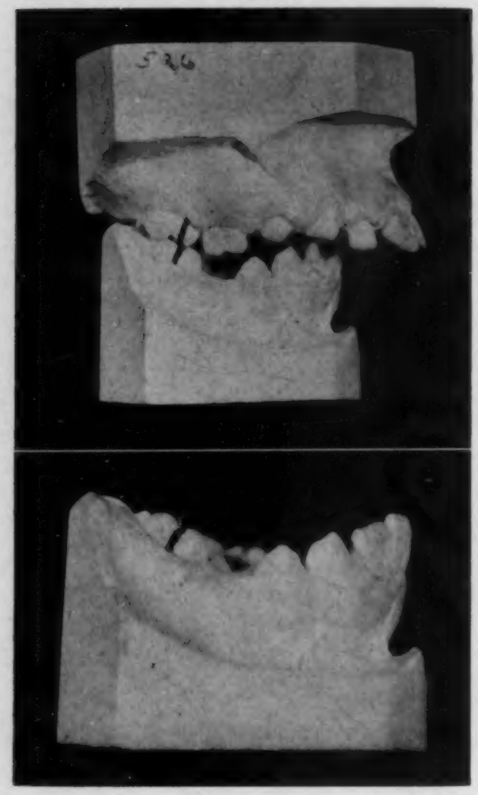


Fig. 21, *B*.

Fig. 22, *A*.

Fig. 22, *B*.

Fig. 21.—*A*, Class II, Division 1, mutilated malocclusion. *B*, Shortening of mandibular arch length and overeruption of mandibular incisors.

Fig. 22.—*A* and *B*, Abnormal relation and function of the facial musculature that contributed to the malocclusion shown in Fig. 21.

Multiple combinations of etiological factors, local and general, will produce severe malocclusion. Such a combination must have occurred in the Class II, Division 1 mutilated malocclusion shown in Fig. 21. The mandibular second deciduous molars were extracted at an early age, and the resultant shortening of the mandibular arch was facilitated by abnormal relation and function of the facial musculature (Fig. 22). The hyperactive mentalis has restricted alveolar growth in the mandibular incisor area and caused the

incisors to overerupt. Basically, the malocclusion may have been of genetic origin, and the tracings of the head x-rays (Fig. 23) reveal a poor skeletal pattern, but the abnormal environmental forces have been equally potent in the molding of the alveolar process and may account for the posterosuperior mandibular displacement as being the result of malalignment of the teeth. Rather than accepting a single hypothesis as the cause, we must also consider the possibility that there may have occurred a retardation in condylar growth that would secondarily retard the eruption of the posterior teeth.

The detrimental effects on the developing denture of hypertonic and abnormally functioning muscles are well known. They may initiate the malocclusion or they may contribute to making an existing malocclusion more severe.

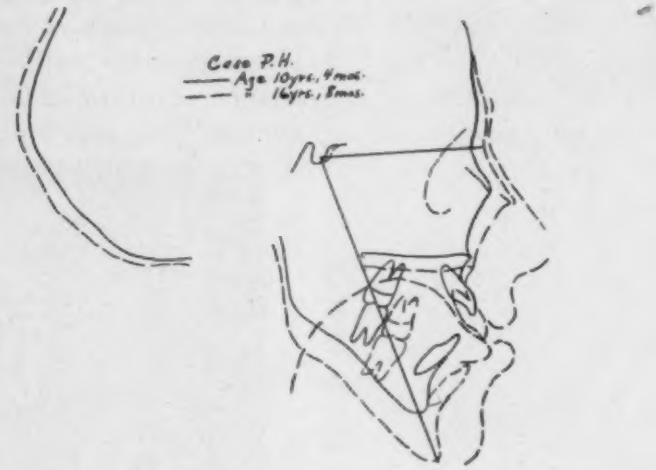
Fig. 23.—Superimposed tracings of the cephalometric x-ray made with the mandible at rest position and with teeth in occlusion in the case shown in Figs. 21 and 22. Note poor skeletal pattern and posterosuperior path of closure of the mandible.

The influence of the tongue may vary from a mild open-bite malocclusion caused by abnormal tongue function to extreme deformities resulting from congenital absence of the tongue, on the one hand, to hypertrophy or hyperplasia on the other. A case of congenital absence that resulted in very constricted dental arches was shown at the 1947 meeting of the Central Section of the American Association of Orthodontists by Shepard of Washington University.

The influence of abnormally large tongues is shown in the next two cases. One is of a boy with a very long and active tongue. It was held continually between the maxillary and mandibular incisors. The head x-ray tracings (Fig. 24) show a distorted growth pattern. It may have been distorted from birth as there may have always been an abnormal disproportion between the size of the tongue and the facial skeleton. The distorted pattern, however, is stable and did not change other than in size in the six-year interval between the two x-rays.

Extreme distortion of the alveolar processes, again the result of an abnormally large tongue that was continually held between the incisors, is illustrated in Fig. 25. In both of these cases the open-bite extended posteriorly to the first permanent molars.

Fig. 24.



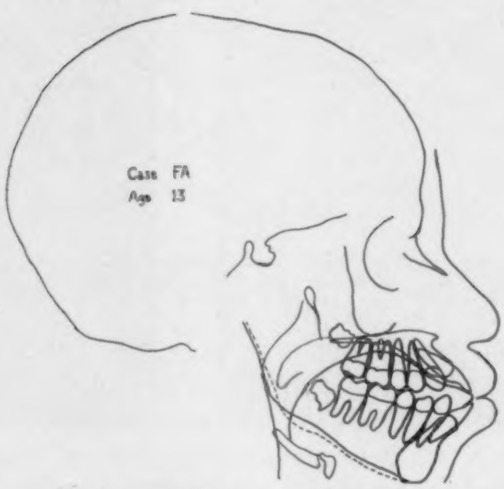


Fig. 25.

Fig. 24.—Superimposed tracings of cephalometric x-rays made on patient with abnormally large tongue.

Fig. 25.—Tracings of cephalometric x-ray on patient with an abnormally large tongue.

Some of the local or environmental factors that have not been mentioned are for the most part well understood by all. It is the questionable and controversial aspects of any subject that require discussion, for these are our problems. Without critical evaluation they will remain to be problems.

I conclude this paper with a few quotations from an article entitled "The Method of Multiple Working Hypothesis" by Professor T. C. Chamberlin. This article was written as a warning to those who adopt one theory as the

cause of any phenomena. It was brought to my attention by Dr. Willett. Chamberlin says, "Three phases of mental procedure have been prominent in the history of intellectual evolution thus far. What additional phases may be in store for us in the evolutions of the future it may not be prudent to attempt to forecast. These three phases may be styled 'the method of the ruling theory,' 'the method of the working hypothesis,' and 'the method of multiple working hypotheses.' "

He goes on to say, "As in the earlier days, so still, it is a too frequent habit to hastily conjure up an explanation for every new phenomenon that presents itself. Interpretation leaves its proper place at the end of the intellectual procession and rushes to the forefront. Too often a theory is promptly born and evidence hunted to fit it aftreward.

"The theory then rapidly rises to a position of control in the processes of the mind and observation; induction and interpretation are guided by it."

In order to avoid this error he says, "To avoid this grave danger, the method of multiple working hypotheses is urged. In developing the multiple hypotheses, the effort is to bring up into view every rational explanation of the phenomenon in hand and to develop every tenable hypothesis relative to its nature, cause, or origin, and to give to all of these as impartially as possible a working form and a due place in the investigation. The investigator thus becomes a parent of a family of hypotheses; and by his parental relations to all is morally forbidden to fasten his affection unduly upon anyone."

I hope that none of my statements have been too positive, because I wish to have considered etiology in the light of a "multiple working hypothesis."

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THE STABILIZING PLATE, AN ADJUNCT TO ORTHODONTIC THERAPY

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INTRODUCTION

THE evolution of modern orthodontic philosophy and present-day orthodontic appliances is a story of the struggle of the profession with what is so often termed "the problem of anchorage." The very term "anchorage" has caused part of the trouble, since it infers absolute immobility of one part of the orthodontic mechanism. Actually this is not true in most appliances, for the teeth, all of which are ordinarily capable of being moved, usually provide the anchorage. An elaborate terminology has been evolved to describe the anchorage offered by the teeth to tipping and bodily movement. We speak of simple anchorage, stationary anchorage, and reciprocal anchorage when it might be more correct to speak of resistance to tipping, resistance to bodily movement, and resistance of similar teeth equally malposed. This terminology permeates our literature and will, undoubtedly, continue to be used. It was originated for a definite purpose even though it is misleading for those of us who have not grown up with the specialty. Ideal anchorage would involve a point for attachment of force application which would not move or respond to physiologic tissue changes. Some ingenious clinician in the future may devise such a system, but until that time and while we are utilizing the appliances at hand, "anchorage" seems an ill-chosen term. Perhaps resistance would be a better word: it will be used for the remainder of this paper.

Another misleading term crept into the literature when molar bands were termed "anchor bands." Because of the surface area of their roots, the molars offer more resistance than any other teeth, but often attempts must be made to move many teeth simultaneously, a practice which would be dubious indeed if our sole resistance lay in the molars. Despite the terms "anchor bands" and "anchor teeth," any appliance distributes and disseminates the forces inherent within it to all the teeth involved by the mechanism, though in varying amounts according to the root surface area and the manner of force application. Therefore, each tooth provides a part of the total resistance.

While the teeth are generally used for resistance, other sources of resistance have been utilized from time to time by clinicians. Many orthodontists routinely use to advantage "occipital anchorage," employing the headcap for this purpose. The rubber devices and tongue depressors which have been advocated for the

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movement of individual teeth into correct occlusion also make use of resistance outside the oral cavity at least in part. Rogers[1] popularized the use of muscular exercises of the lips and cheeks in the correction of certain dentofacial deformities, thus providing another source of extraoral resistance. Ordinarily, the muscles are not thought of as sources of resistance for tooth movements, but that is indeed what they are, and a great deal must yet be learned about their action in the genesis of malocclusion and their utilization in therapeutic methods. So also are the fingers, thumbs, and lips involved in the sucking habits of early childhood, sources of resistance just as capable of aiding tooth movements as the molar teeth. The various forms of the full-banded appliance were evolved as efforts on the behalf of clinicians to acquire more and better-controlled resistance. Tweed[2] and others in recent years have taken more radical steps and have advocated gaining mechanical advantage by producing a distal axial positioning of the teeth in the anchorage denture. This results in the so-called "toe hold anchorage."

Higley and Gainsforth,[3] working at this school, approached the problem of increasing total resistance from a rather unique angle, that of devising a method of attachment to the medullary bone as a source of resistance for orthodontic utilization. Screws and rings of tissue-tolerant alloys were implanted in the mandibular medullary bone of dogs and used as resistance during the experimental movement of teeth. In all instances the tissues rejected the foreign bodies, and though the screws did not move as a tooth moves, there being no periodontal membrane present, there was sufficient tissue response to cause them to be sloughed away. While this first attempt was not successful, other methods for the utilization of medullary bone as a source of resistance are being investigated.

All this indicates the interest of the profession in providing more efficient resistance in the clinical treatment of malocclusions. It also seems to demonstrate that there has been a too static concept of resistance and that teeth alone do not offer sufficient resistance to produce the changes desired through orthodontic therapy. Several years ago we began a search for more efficient resistance methods. From this effort the stabilizing plate has been evolved. A description of its design, construction, and clinical uses is presented in this paper.

DESCRIPTION

The stabilizing plate (Fig. 1) is an acrylic resin device similar in design to the Hawley retainer. It is fashioned to contact the lingual surfaces of all the teeth in a particular dental arch in addition to as much mucosal tissue as is feasible. It is supplied with vertical round or half-round shafts which insert into vertical lingual sheaths attached to the molar bands. These offer sufficient friction to hold the plate in place. It is applicable to either maxilla.

Most orthodontic appliances are designed to pit one tooth or group of teeth against another tooth or group of teeth, offering less resistance in order that the latter may be moved. The stabilizing plate is an effort to provide better dental resistance for this procedure in addition to the resistance offered by the mucosal tissue with its underlying bone. For example, if the stabilizing

plate in Fig. 1 is pitted against certain teeth of the maxillary arch, it utilizes the combined root surface area of all the mandibular teeth in addition to the surface area of the mucosa and underlying bone covered by the plate. Before resistance would be lost, all of the mandibular teeth would have to move simultaneously as well as have the plate begin to imbed itself in the lingual cortical bone of the mandible. The stabilizing plate is designed to provide a more efficient method of reinforced resistance than is possible when the teeth are used alone. Although not always possible, it is desirable to place the plate before any tooth movement has been accomplished. This makes it unnecessary to undertake any heroic tooth movements to prepare resistance within one denture for the purpose of tooth movements in the opposing denture. It also appears advantageous not to create an extensive reaction among the transient cellular elements of the bone until actual movement is desired.

Fig. 1.—Mandibular stabilizing plate with labial arch wire.

CONSTRUCTION

Two construction procedures are utilized depending upon the case: (a) when molar bands are uncemented at the time of the construction of the stabilizing plate, e.g., at the start of treatment and (b) when molar bands are cemented in place on the teeth, e.g., when a plate is replacing a lingual arch wire.

Steps in Construction.—When molar bands are uncemented:

1. Fashion molar bands in the accustomed manner taking care to solder the lingual round or half-round sheaths perpendicularly and parallel to one another.
2. Take an impression of the arch with the uncemented bands in place on the teeth. This may be done with either alginate or agar hydrocolloid. Sometimes the use of compound in the molar region of the tray is advantageous.
3. Remove molar bands from the teeth and seat them in their proper position in the impression. If compound was used, they may have come off in the impression.
4. Pour the impression with an extremely heavy mix (putty consistency) of stone.
5. Construct a wire framework as shown in Figs. 1 and 2 and wax up plate, taking care to extend the wax well onto the lingual surfaces and into the em-

brasures. Festooning around the teeth as is done around the artificial teeth in dentures is to be avoided. A broad, flat contact of acrylic with the teeth is desired. If the wire framework holding the half-round is for the maxillary arch (Fig. 2), it is best to cover the lingual surface of the molar band or overlay with a layer of heavy tinfoil before waxing. This facilitates the removal of the band from the cured acrylic resin.

6. Process the acrylic resin by the regular method.

Fig. 2.

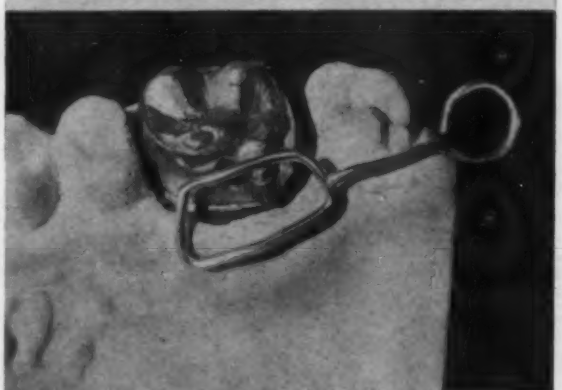

Fig. 3.

Fig. 4.

Fig. 2.—Framework for a maxillary stabilizing plate.

Fig. 3.—Posterior extension on framework for maxillary stabilizing plate.

Fig. 4.—Maxillary cast ready for waxing. Note how the posterior extension is covered by stone, thus holding the framework in its proper relationship.

7. Remove the molar bands from the cured plate and cement them in place on the teeth.

8. Polish plate and insert in the mouth after complete setting of cement beneath bands.

When molar bands are cemented in place:

1. Construct half-round frameworks with an extension posteriorly (Fig. 3).
2. Insert half-round frameworks in the mouth on either side and take an impression with either alginate or agar hydrocolloid. The framework will remain in the impression material on removal of the tray from the mouth.
3. Carefully cut away the impression material until the posterior extension is fully exposed.
4. Pour the impression with a heavy mix of stone, taking care to enclose the posterior extension in the stone. A cast after the stone model has been removed from the impression is shown in Fig. 4. This is now ready for waxing.
5. Wax up the model in the usual manner.
6. Process the acrylic resin by the accustomed procedure.
7. Carefully remove the plate from the flask and cut off the posterior extension before polishing.
8. Insert in the mouth.

Fig. 5.

Fig. 6.

Fig. 5.—Cuspid retention clasp for maxillary stabilizing plate using a round wire lug.
Fig. 6.—Split mandibular stabilizing plate used to upright a molar.

Modifications in Design.—A wire may be extended through the maxillary cuspid embrasure to aid in the retention of maxillary plates. This small (0.020 inch) steel wire can be snapped into a bracket on the cuspid band, or a lug of round wire may be used in place of the bracket to secure the spring wire (Fig. 5). In Fig. 6 a steel circular spring has been inserted into the acrylic resin for the distal and uprighting movement of a mandibular molar which has tipped anteriorly because of the premature loss of a deciduous second molar. The plate with enclosed spring is cured solidly and then split with an abrasive disk. After the molar is in its correct position, the plate may be recured so that it is one solid piece again.

CLINICAL USAGE

As the name implies, the stabilizing plate has as its purpose the stabilization of a denture as a unit during active treatment. It is used (a) to stabilize one denture for movement of teeth in the other and (b) to combine the teeth and bone of the mandible into a single stabilized unit to provide the maximum possibility of mandibular repositioning. Obviously, the highest percentage of the cases requiring the second usage are those in the younger age groups.

Fig. 7.—Mandibular stabilizing plate used for treatment of a malocclusion of the mixed dentition.

The stabilizing plate can be used as an adjunct to many varied appliance mechanisms. Carey advocates the use of a stabilizing plate in the maxillary denture while obtaining distal movement of the lateral segments of the mandibular arch with his "sliding twin section" mechanism. This is done with two edgewise segments adapted passively to the brackets of the molars, premolars, and cuspids only on either side in the maxillary denture. While Carey tips the mandibular posterior teeth distally to establish the so-called "toe hold anchorage," it has been found advantageous to do this only for the purpose of obtaining space for anterior alignment. After the mandibular sliding twin section is applied and dental movements are begun in the maxillary arch, the insertion of a mandibular stabilizing plate will help maintain the mandibular teeth in their new positions as well as provide more resistance for maxillary tooth positioning. When the mandibular arch is in satisfactory alignment at the start of treatment, and this is often the case, much will be gained by *not* moving the teeth and inserting a stabilizing plate which will provide the resistance for subsequent tooth movements. In addition, no treatment time will be lost acquiring resistance. The stabilizing plate has been used with Johnson twin-wire appliances, plain round labiolingual variations, and the edgewise mechanism. It also has been used to stabilize the mandibular arch while moving maxillary cuspids distally after the extraction of the maxillary first premolars. In all these cases it has been used to stabilize one denture for tooth movements in the opposite arch.

Many cases present themselves in which the orthodontist is eager to begin treatment in the deciduous or mixed dentitions, but treatment is deferred simply

because a satisfactory appliance cannot be designed. In such cases one is usually most concerned with the anteroposterior relationship of the dentures and the position of the dentures and/or the mandible with regard to the cranium. The niceties of minor tooth alignments are only secondary causes of concern. A stabilizing plate used in conjunction with overlays on both deciduous molars in each quadrant will provide satisfactory resistance and stability of appliance design for the treatment of many of these cases (Fig. 7). Such an approach to the treatment of these cases puts all the emphasis of correction on the repositioning of the mandible, retraining of the muscular pattern of the temporomandibular joint, or upon inciting actual growth in the mandible, particularly the condylar area. Clinical results seem to bear out the fact that such results are possible if treatment is begun at an early age. The stabilizing plate is an adjunct that may provide a means of designing more satisfactory appliances for the deciduous and mixed dentitions.

PATIENT INSTRUCTIONS

The same instructions for care and cleaning that are given to patients wearing Hawley retainers apply to the stabilizing plate. However, greater care must be exercised in the insertion and removal of the plate.

SUMMARY

The stabilizing plate, an adjunct to orthodontic mechanical therapy, has been presented. A description of the device, methods of construction, and its clinical usage have been given.

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TREATMENT OF IRREGULARITIES OF THE TEETH AND THE JAWS BY MEANS OF ACTIVATORS (ROBIN-ANDRESEN METHOD)

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IT IS not the intention of this article to oppose Angle, the founder of modern orthodontics and among whose pupils I have the honor of belonging. However, it would not be the wish of this great master who, even in the latter part of his career, improved his appliances by the construction of the edgewise arch, that the development of orthodontics should end with his death. On the contrary, it is our duty to accept new ideas and to seek further development of the science that he founded.

The Angle arch is an irremovable appliance that works partly by continual forces, viz., by the elasticity of the arch, partly by intermittent forces, and in protruding the incisors by means of screws. At the beginning of this century Robin of Paris and recently Andresen of Oslo have suggested a new principle incorporated in their device called an activator, the "monobloc." The latter utilizes as forces short intermittent pressures. These are produced by the muscular function and are directed by the appliance in such a way that the teeth are moved toward the intended position.

Histologic changes provoked by the regulation of the teeth were thoroughly studied by Oppenheim and discussed between him and Schwartz. The effect of short-time working forces as produced by the activator were histologically studied by Häupl.

Oppenheim found that when the pressure does not exceed the biologic limit, intermittent forces cause compression of the periodontium and increase the capillaries and the osteoblastic resorption of bone on the side where the root is pressed against the bone. On the traction side there was an enlargement of the periodontium and apposition of the bone. A similar process is produced in the surrounding spongiosa of the bone. If the pressure was driven beyond the biologic limit with the intermittent forces, ischemia and necrosis of periodontium develop on the side of the pressure. But after a short time of rest, a reparatory process comes into action and the bone and cement undergo resorption. The latter can penetrate as deep as into the dentine. As a rule resorption of the cement is later repaired by the apposition of secondary cement. However, in other cases, it may persist. In nearly all cases treated with the nonremovable appliances Oppenheim found resorptions of the cement.

Appliances working with continual forces are much more dangerous than those with intermittent forces. In continuously working appliances the spring moves the tooth with the same force during the entire time. Therefore, reparation cannot take place and the destruction continues. On the contrary, when

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using the screw, periods of pressure alternate with those of rest and the reparatory process is permitted.

The effect produced by the appliance working with knocking forces* is quite different. Here a very great strength may be applied because it is controlled by the patient. If the teeth become sensitive as is often the case, the patient reduces the pressure on the teeth by limiting his biting. As a result the sensitivity of the teeth is reduced. The force is produced for a very short time. Even though the patient tried to shorten the treatment by biting continuously into the appliance, he would soon tire. As a strange body the appliance provokes frequent biting and chewing movements in a manner similar to the rubber teat or chewing gum. Strong as they may be, the short-time working pressures are equalized by the intervals of rest. During these times the blood circulation is quickly restored and the tissue may recover. A similar effect is produced by biting hard food. Here the pressure reaches a degree as high as 40 to 160 pounds. This function is very important for the regular development of the teeth and jaws. There is only one difference; that is, that pressure is transmitted in the direction of normal development of the jaws through the action of the activator. This has been confirmed histologically by Häupl, who in examining the teeth thus treated found no resorption of the roots. Moreover, it is my impression that the jaws and the muscles grow stronger when masticatory movements are performed often.

Only the oldest orthodontic appliances are rigid and hard and thus produce pressure effects. These include the bite plate for heightening the bite and earlier the oblique plane described by Kingsley seventy years ago. The original illustration of this appliance corresponds to the most modern form, and according to his statement, antedated him. The same is true of Hawley's working retainer constructed not only with a view to heighten the bite but also for protruding the lower jaw. All of these appliances were constructed only for one jaw. The Robin "monobloc" invented in 1902 was the first appliance which simultaneously expanded both the upper and lower jaw and enabled jumping the bite. Essentially, it was constructed as an upper and lower base plate joined together. By means of Coffin's spring both jaws were enlarged at the same time.

Andresen used a similar appliance for the treatment of Class I and II cases. He constructed it in such a way as to make the patient bite into wax with his lower jaw protruded into the Class I position, leaving a space of 1 mm. between the upper and the lower teeth. According to this bite he modeled a monobloc (an upper and a lower base plate joined together). To this monobloc he attached an upper labial arch in order to retrude the incisors and to fix the instrument at the same time. To assure the retrusion of the incisors, he gradually cut out the rubber so that it would not touch these teeth.

This appliance functions in two ways. First, when the patient wants to close the mouth he is forced to protrude the lower jaw into the same position as that in which the constructive bite was made. Consequently the protractors, viz., the muscles protruding the lower jaw (the pterygoid and masseter),

*Term descriptive of nature of activator pressure.

are being trained and strengthened. Secondly, when the mouth is shut in this Class I position the tension of the protractors no doubt relaxes but at the same time the tension of the retractors (mylohyoideus, geniohyoideus, and genioglossus) sets in and these draw the mandible back into the Class II position. These movements are opposed by the activator and thereby a pressure is produced against the lower teeth. The effect of the muscular tension and of the resistance of the activator is such as to strengthen the protractors which, while shutting the mouth, actively protrude the mandible. Simultaneously, the alveolar process of the mandibular angle and joint undergoes transformation.

After having succeeded in the treatment of Class II cases, Andresen attempted to treat other irregularities in a similar way. He produced pressure against singly dislocated teeth by means of wooden blocks inserted into the appliance, by gutta-percha pellets, or by cutting the rubber in such a way as to make it touch the teeth only in one point, and thus moved them in the intended direction. However, these measures proved insufficient.

The origin of the idea of supplying the activator with strong, rigid, metallic wires is not of importance to me. In my department, wires have been used for a long period independently of other initiators. They have the advantage of not being as readily worn out as gutta-percha or wood and may be readapted, if necessary, by simple bending. Formerly, we used only strong, inelastic wire in accordance with the principle of Andresen. The latter worked with inelastic appliances, bending the wire to the effect that it touched only the teeth. I have discarded this principle and for the last two years used elastic springs made of a thinner wire. Since only knocking forces are applied, one needs not be afraid of injury. No lasting damage can occur even if the biologic limit is exceeded. In this way it has been possible to transform Andresen's passive inelastic activator into an elastic very active appliance. This apparatus is much more effective and does not require that the patient be seen as frequently.

The springs must be bent in such a way as to slide on the side of the teeth and not to rest on their occlusal surfaces. If the latter was the case, the result would be negative. The best indication is protruding the incisors, as these slide easily on the oblique planes of their oral surfaces. However, they may also be used for the mesiodistal movements of all teeth. On the other hand, they cannot be applied for the buccal movement of premolars and molars because the oral surfaces of these teeth are too perpendicular. For the expansion of the teeth we use a double Coffin spring placed in the middle of the palatinal plate of the activator. In those cases in which the incisors must be retruded, we even make the labial arch of an elastic wire.

PERSONAL EXPERIENCES WITH THE ACTIVATORS

For twenty years we treated a great majority of our patients with the Angle arch and the results were satisfactory. However, a certain number of cases were treated with edgewise arch. We also attempted for some three years to use Mershon's appliance but found it inconvenient and dangerous and discarded it. During this period we became aware of the danger of appliances working with continual forces.

Before the second world war we began treatment according to the Robin-Andresen method, and the first results were not completely satisfactory owing to the inconveniences mentioned previously. Therefore, we began to apply the wire attached to baseplate. We had previously used this for mesiodistal dislocation of singular teeth. Thus the indications for the use of the activator multiplied and at present I work almost exclusively with springs instead of inelastic wires.

ADVANTAGES OF THE METHOD UNDER QUESTION

1. The activator does not harm the tissue of periodontium. The stronger the patient bites into the appliance, the greater is the force applied. The latter is controlled owing to the sensitiveness of the teeth. The mobility of the teeth is very slight and quickly disappears.

2. With the use of the activator, the danger of increased caries susceptibility, a strong argument against Angle's method, is entirely absent.

3. In the treatment of the Class II cases there is not the inconvenience of wearing of intermaxillary elastics. The greatest disadvantage of the intermaxillary elastic is that the whole force rests only on the first molars and these are overburdened by the continuous pull. Very often, particularly in the cases of protracted treatment, the teeth are loosened and resorptions of the roots, chiefly of the upper ones, take place. The activator, on the contrary, distributes the pressure proportionally over the whole dentition, and force is only a tapping one. Furthermore, with the Angle appliance the lower jaw is passively drawn in the mesial direction whereas with monobloc it is actively pulled by the muscles which become trained in a similar manner to that achieved by the exercises of Rogers. Fixed appliances were often removed too early and as a result retention was difficult. Therefore recession often occurred. On the contrary, when the activator is used it can serve as a retainer.

4. Frequent relapses may be explained by hereditary tendencies. These influences have been underestimated. A congenital anomaly has the tendency for irregular growth during the entire development time of the jaws, and therefore artificial retention is necessary. Using the activator we have the advantage that the same appliance which was used for treatment can be used as well for the retention. I recommend it as a retainer only during the night or occasionally during the day. I use the appliance as an active one and allow it to be worn all day and night if there appear any signs of relapse.

5. It is difficult to retain the unremovable appliances in young patients. The same appliances are used with difficulty even in children, as they are lacking most of their permanent teeth and this may be the most important time for the beginning treatment. Monoblocs (activators) may be used without any regard for the state of the denture, although our youngest patients are only 4 years old. Those children who are accustomed to sucking the thumb, especially, like to exchange a rubber teat for an activator.

6. As these appliances may be used in early childhood, their construction does not present any difficulties for the orthodontist. Since the children become accustomed to them very quickly, they may be used as preventive appliances.

7. Since they are removable they may be applied in those cases where occupations prevent the use of unremovable appliances. For example, I am treating some pupils from the dramatic schools and singers.

8. The monobloc (activator) does not have to be controlled as often as an unremovable appliance. The usual calls are once a month. However, it is sufficient if a patient from a distance comes only once in two or three months. Under these conditions we must rely on him diligently to carry out the home treatment.

9. Repairs are rare and are performed in the laboratory so that they do not delay the orthodontist. The use of pliers with round edges is important to prevent injury of the wire when bending it. In most cases one activator will suffice and the same may also be used as a retainer. At the first visit the dentist needs only to take an impression, study the cast and take the constructive bite, make the local and general examination of the patient, and determine the treatment plan. The appliance is constructed in the laboratory. The routine visits require only a very short time. Employing a technician and two assistants, it is possible in six hours to perform 50 activations and accept 2 new patients. This means 250 old and 10 new patients in a week. Since the patients come in once a month, one dentist is able to treat about 1,000 patients besides accepting 2 new ones daily. Thus if 10 newcomers a week, or 40 per month, are accepted and if one disregards the two months of school holidays, 400 newcomers may be accepted in a year. In this way a total of 1,000 patients can be achieved in two and one-half years. This is about the average time of treatment. After this time as many patients are dismissed as accepted, and the number of cases is therefore a constant limit. This calculation could be used for public clinic planning.

DISADVANTAGES OF ACTIVATORS

1. The chief disadvantage is that the operator is dependent on the trustworthiness of the patient or his parents regarding the use of the appliance. However, I cannot complain of this deficiency since the children soon become accustomed to the monobloc and older patients wear it diligently possibly because of personal vanity. Cases of loss of the activator are rare.

2. Since the patient wearing the activator is unable to breathe through the mouth, it is important that the nasal passage is open. Therefore, if vegetations are present, they must be taken out. On the contrary, patients accustomed to mouth breathing are forced to breathe through the nose while carrying the activator.

3. Monobloc activator is unable to improve several types or irregularities, for instance open-bite cases and protrusion of the mandible. Deep-bite cases are treated simultaneously by means of the bite plate.

4. Patients are not able to speak while carrying the appliance.

Finally, I will recapitulate some of the modifications I have made in this method:

1. I have discarded the Andresen principle of passive, inelastic appliances and am using the springs which make the activator more efficient and limit patient's visits.

2. I advise the wearing of the appliance chiefly during the day (according to Robin) in contradiction to Andresen. The activator "monobloc" irritates the muscles during chewing movements when the patient is awake, and its efficiency is increased because of these movements. I prescribe it during certain occupations, for instance while reading or writing, playing, and in school. After the patient has become accustomed to it I advise its use during the night. This is not of too great importance since the appliance cannot be efficient if the muscles are relaxed. When this occurs the appliance very often falls from position.

3. I advise the same appliance as a retainer after the treatment has been finished. During this time it serves as a good control, and in cases or relapse it may be used again as a regulating appliance.

The following cases are typical of those treated in our clinic. Not only are the models shown, but pictures of the appliances are included.

In the cast 2052 the lower incisors were in protrusion. The upper teeth were in regular position, but in the lower jaw there was a 4 mm. space between the cuspids and premolars on both sides, and the lower incisors were biting in front of the upper teeth.

The object was to retrude the lower incisors, and this task was executed by means of an activator. The appliance was provided with an elastic labial arch, pulling the lower incisors and cuspids lingually. There was left a space between the body of the monoblock and the lower incisors and cuspids for these teeth not to be hindered in their lingual movement. In Fig. 1 we see the case before the treatment, the appliance, and the result of the treatment.

Cast 3358 is of a boy aged 9 years. It is a Class II case on the left side, deep bite, and a 7 mm. wide diastema between the upper first incisors. As a result there is no place for the second incisors, which are retained. In cases like this it is advisable first to elevate the deep bite by means of a bite plate. After having raised the occlusion of the incisors, a monoblock has been constructed, which forced the lower jaw into the first class position. The appliance was supplied with a labial arch to retrude the upper incisors and with two springs in order to move the upper first incisors together. The initial cast, the appliance, and the result of treatment are shown in Fig. 2.

Cast 2742 is of a typical case of Class II irregularity in a girl aged 11 years. Although the width of the upper jaw is correct according to Pont's index, it was necessary to expand this jaw in order to move it into normal occlusion with the mandible. There is a protrusion of the upper incisors with spaces between them. The lower dental arch is normal. In the intermaxillary region there is a retrusion of the lower jaw by the width of a premolar, and a deep bite. The lower incisors bite into the palate 3 mm. lingual to the upper incisors. After the bite had been elevated by means of a bite plate, an activator was constructed which forced the lower jaw into the Class I position. The appliance was supplied with a labial arch to retrude the upper incisors. A space was left between the block and the upper incisors. This gave these teeth the possibility of retrusion. Furthermore, two springs were attached to pull the upper cuspids back. In order to expand the upper jaw, the block was cut through in the middle plane

Fig. 1, *A*.

Fig. 1, *B*.

Fig. 1, *C*.

Fig. 2, *A*.


Fig. 2, *B*.

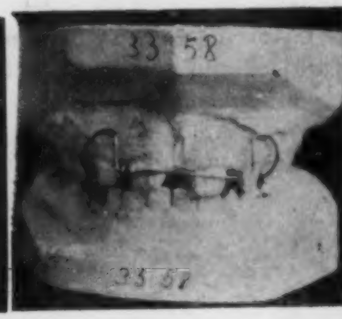

Fig. 2, *C*.

Fig. 3, *A*.

Fig. 3, *B*.

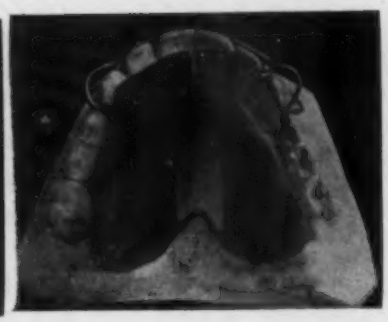
Fig. 3, *C*.


Fig. 4, *A*.

Fig. 4, *B*.


Fig. 4, *C*.

and provided with a double Coffin spring. The casts made at the beginning of the treatment as well as the appliance and the casts after the treatment are shown in Fig. 3.

Cast 2235 is of a patient aged 11 years. The lower deciduous molars have been lost and the place for the second lower premolars is narrowed. The lower anterior teeth are biting into the palate. The upper jaw is 5 mm. too narrow; the incisors are protruded.

In this case the bite block was constructed so that the incisors were almost in the normal occlusion. The appliance was provided with a labial arch to retrude the upper incisors and with double Coffin spring to enlarge the upper jaw. The lower front teeth had been protruded by means of a spring. Another wire rest prevented the lower first molars from drifting forward.

After a two-year treatment by means of an activator, the upper jaw was expanded, and the incisors were retruded. The lower anterior teeth and first premolars moved forward, and place was gained for the second lower premolars. The effect of the treatment is shown in Fig. 4.

From these few cases, selected from different types of irregularities, it may be seen that the activator is a versatile appliance.

Prague III Újezd 35.

MECHANICAL THEORIES ON PERIODONTOCLASIA AND CONSIDERATIONS OF FIXING APPLIANCES

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I. IMPORTANCE OF MECHANICAL THEORIES ABOUT PERIODONTOCLASIA

IF WE examine the periodontal disease problem from a practical viewpoint, we must admit some headway has been made with the application of mechanical-functional principles when considering those cases. These principles (due to Karoly and his school and later on improved by Palazzi) show the practitioner the straight way in the prophylactic and therapeutic fields.

We may surely say that, even if not all periodontal diseases are of mechanical origin, almost all have the mechanical factor playing a big role and are improved by mechanical treatments. We shall now see how the theoretical principles on the etiogenesis bring us to gymnastic prophylaxis, to prophylaxis with orthodontic appliances, to the mixed forms of prophylactic therapy represented by: grinding, stress-relieving with removable appliances, and stress-relieving and fixing with fixed appliances.

II. THE "SLEDGE" ARTICULATION

Karoly and his school started from the consideration of the "sledge" articulation which, while common in prehistoric and primitive ages, has almost disappeared nowadays. In this type of articulation the curve of Spee is exactly what is required to compensate the condylar movements; there is no overbite and the incisors bite in the central occlusion, edge to edge. We can see here:

1. In the centric occlusion the muscular stresses are axially distributed on every tooth. (When there is overbite the incisors receive a dangerous horizontal stress and the back teeth are axially overstressed because the relief brought by the edge-to-edge contact of the incisors is lacking; *and this relief is noteworthy if we consider the position of the incisors in the mandible in respect to the muscles.*)

2. In every other position the two dental arches present the maximum possible occlusal contact surfaces and points between them, and that results in the best stress distribution.

3. That form in the change of the various positions permits the continuous and uniform occlusal contact and sliding between all the opposite teeth, thus facilitating self-grinding.

Self-grinding brings about the following advantages:

a. The continuous movements of the teeth in respect to the maxillary bones are gradually compensated by an equally continuous reciprocal grinding that

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helps to keep the muscular stress distribution homogeneous; that is, to keep, in alveolar regions, a balance in the axial direction between tension and compression, and as we shall see later.

b. Self-grinding continuously shortens the extra-alveolar portion of the tooth, and that results in less work under the horizontal stresses for the intra-alveolar portion, if we consider the tooth as a lever.

III. NATURAL FORMATION AND MAINTENANCE OF THE "SLEDGE" ARTICULATION

Searching the factors that during the individual growth may bring about the "sledge" articulation, scientists stopped their observations on the stresses that develop in the maxillary bones while the anterior portion of the mouth is being mostly employed, as, for instance, when sucking in breast-feeding, nibbling, gnawing, tearing (protrusion of the mandible to reach incisal edge-to-edge bite). Let us consider this fact at the light of Wolff's law.

Every change in the form and function of bone or their functions alone is followed by certain definite changes in their internal architecture, and equally definite secondary alterations in their external conformations in accordance with mathematical laws.

We know that alterations of bone structure are accomplished by two well-known processes: (1) Increased growth, physiologic hypertrophy; (2) diminished normal growth, physiologic atrophy, absorption. The tension stress stimulates physiologic hypertrophy and increased growth; the compression has the opposite effect. Let us consider a mandible working as we said with its anterior portion (Fig. 1). It is influenced by three groups of stresses:

1. The condylar head is pulled backward by the eminentia articularis and the connectival complexus controlling the protrusion.

2. At the opposite end the lower incisors are thrust downward by the upper incisors by means of objects placed between their incisal edges, and by these objects they are also pulled forward.

3. About the middle we have the third group of stresses represented by the masseter and internal pterygoid muscles.

The mandible in this condition can be likened to a curved beam we endeavor to flatten as you can see in Fig 2. Its upper half is in a state of tension (with a maximum toward the upper surface and the middle of the length), while its lower half is in a state of compression (with a maximum toward the lower surface and the middle of the length). In the middle of the beam there is a neutral zone called neutral axis.

In the mandible too there is the same division. The zone over the "canalis alveolaris inferior" as far as the condylar head is in tension: it is a zone of tension that constitutes the trabecular system named by Walkoff "trajectorium dentale." The trabecular pattern of this "trajectorium" we see in the x-ray photographs of the mandible represents exactly the lines of tensile stress in their direction and intensity. The growth tendency corresponds to the tension; we have then tendency to the lengthening and flattening of the "trajectorium dentale."

Among the most important effects are the following:

1. Advancement of the whole lower dental arch.
2. Eruption of the back teeth.
3. Flattening and lengthening of the curve of Spee with advancement of the lower incisors.
4. Formation of room for the lower third molars.

Let us now consider the influence of the previously examined functions on the upper incisors. We see:

1. Their labial version is controlled by the backward pression made against the labial surfaces of their crowns by lip muscles strengthened by function.

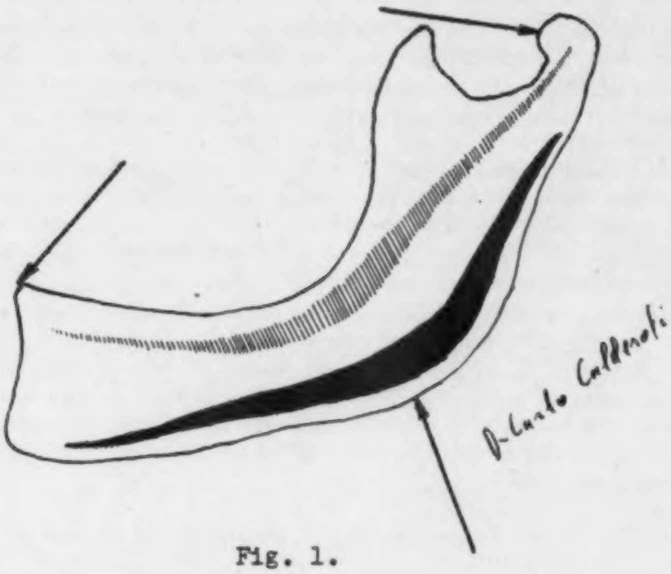

Fig. 1.

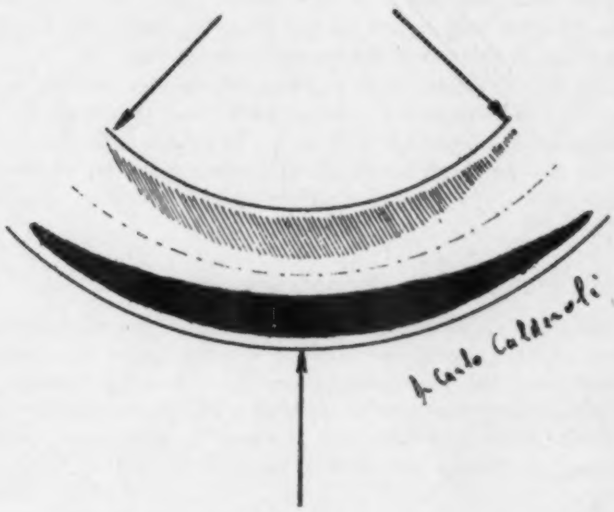

Fig. 2.

Zone in tension

Neutral axis

Zone in compression

2. Their eruption is controlled by the compression made against their incisal edge by the incisal edge of the lower incisors (through some substances or directly).

These facts happen when the dental arches work with their anterior portions (mandible protrusion). For every other working position we could examine in such a way the relative static situation. It results that the form of the dental arches (considered axially) is automatically created through "eruptions caused by the tension" in the most frequently employed positions; that is, in every position the teeth which do not result in occlusal contact with their antagonists come to have their alveolar bones in tension and therefore in growth; these teeth erupt until they find a limit in the occlusal contact of the antagonists. The position of every tooth, considered in the axial direction, is therefore a result of the balance in its alveolar bone between: (1) *compression* due to his occlusal contact; (2) *tension* due to occlusal contact of other teeth of its dental arch.

During their growth the dental arches take the best suitable forms to permit a "status" of balance, between compression and tension in their alveolar bones, in the positions more frequently employed. In primitive life the mouth develops working in every position for which it was made. Breast-feeding begins; then the natural work of every part of the dental arches and of the muscles of the mouth (sucking, nibbling, gnawing, tearing, drinking without any vessel, and so on). *By this way we have the natural formation and maintenance of the "sledge" articulation.*

IV. CIVILIZATION AND PERIODONTAL DISEASES

In civil life the mouth lost many of its functions, sometimes just from the birth through bottle feeding. Food artificially prepared, utensils, and table manners (which prevent, besides many other things, from using the anterior parts of the dental arches and the lip muscles) have abolished many of the natural exercises. The dental arches have little work to do and almost only in the central position; therefore they come to take such forms as to present an axial balance in the central position only.

Thus we explain the diffusion of the overbite, of the increased curve of Spee, of distal bite (Angle's Class II), and of impacted lower premolars and third molars.

Those mouth features, proper of civil races, bring about a serious alteration of the natural mechanical laws concerning the muscular stresses distribution in the ideal "sledge" articulation (Paragraph 2). In these alterations we see the first roots of the periodontal diseases.

V. ARTIFICIAL FORMATION AND MAINTENANCE OF THE "SLEDGE" ARTICULATION

These theoretical principles prove the rationality of the myofunctional therapies of Karoly and Rogers, of the appliances called "myofunctional" or "biomechanical" as those of Rogers, Andresen, the vestibular plates (Korbitz's lipsformers), and many other orthodontic appliances trying to realize in the mouth situations similar to the one examined in Paragraph 3. These methods of treatment represent a replacement of those natural exercises that play a big roll during the growth in forming and maintaining the "sledge" articulation.

a. Gymnastics.—With the interincisal gymnastics (suggested by Karoly) children must periodically bite the incisors edge to edge and nibble various substances with these teeth. Many other exercises (Rogers) tend to influence the shape of bones through muscular activity. Such gymnastics must be made as early as possible. The earlier gymnastic prophylaxis is performed in cases of bottle feeding by using rubber caps more anatomic than the usual ones.

b. Orthodontic Appliances.—The examination of the various orthodontic appliances is not for us; we shall mention only the main actions:

1. *Bite raising and forward sliding for lower incisors;* so we realize in the mandible the static situation of Fig. 1.

2. Another help in this direction is given by *the intermaxillary elastics.* By means of this appliance we put in tension particularly that segment of the "trajectorium dentale"

between the last teeth and the condylar head with a resulting particular advancement of the whole lower dental arch.

3. As to the upper teeth we endeavor to obtain: *the palatoversion of the upper incisors and the intrusion (or the control of the eruption) of the upper incisors.*

c. Grinding.—When, because of the patient's age, we cannot hope to obtain the "sledge" articulation through osseous alterations, we shall use the grinding process. . . .

(A technical description of procedures and appliances follows.)

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Editorial

Fluorine Facts and Fallacies

TOPICAL application of fluorine is being given approximately 50,000 preschool and school children at Department of Health Dental Clinics in 105 schools and 14 District Health Centers in New York City. The fluorine treatment program is under the direction of Dr. Harry Strusser, Director of the Department of Health's Bureau of Dentistry.

Dr. Strusser, in the press releases of the Department of Health, warned the public that the fluorine application is not a substitute for regular dental care and hygiene. In spite of this warning, the public, aided in some instances by dentists themselves, is beginning to treat the entire subject of fluorine in the light of a "sure cure." Many dentists are resorting to the questionable practice of calling their patients on the telephone and advising them to bring their children for the application of fluorine in order to prevent tooth decay.

The facts on the topical application of sodium fluoride after one year of study have been presented by the United States Public Health Service* as follows:

1. The use of calcium chloride as a supplemental treatment does not enhance the caries-inhibitive action of sodium fluoride.
2. The caries-inhibiting effect obtained when the applications were spaced at one or two a week was found to decrease when the applications were spaced at intervals of three or six months.
3. Apparently a 1 per cent solution of sodium fluoride is as effective as a 2 per cent solution. However, clinical experience with the prophylactic effect of a 2 per cent solution is at present far more extensive than with solutions of lower concentration.
4. Application of the fluoride solution to the teeth by means of a spray appears to be as effective as when application is made by cotton applicator.

Studies of the United States Public Health Service have shown that a series of four applications of a 2 per cent solution of sodium fluoride, preceded by a single prophylaxis, effects a 40 per cent reduction in dental caries incidence. Treatments must be repeated for newly erupted teeth. The caries-inhibiting value of topical fluoride therapy is not decreased appreciably during a three-year period following treatment. The omission of a dental prophylaxis prior to the series of applications reduces the effectiveness of the treatment by approximately half.

A major note of warning was presented in an editorial in *The New York Journal of Dentistry* **18**: 244-247, August-September, 1948, by Dr. Henry C. Sandler of the Dental Bureau, New York City Department of Health. Dr. David B. Ast, Head of the Dental Bureau of the New York State Department

Reprinted from *The New York Journal of Dentistry* **18**: 369-370, December, 1948.

*Galagan, D. J., and Knutson, J. W., Pub. Health Rep. **63**: 1215-1221, Sept. 17, 1948.

of Health, at the stated meeting of the First District Dental Society in October pointed out the danger of overlooking the 60 per cent of decay that sodium fluoride leaves unchanged while it is reducing the incidence on an average of 40 per cent.

It is important to note that the 40 per cent reduction in dental decay following the topical application of sodium fluoride is only a relative decrease and not an absolute one. As explained by Frances Krasnow, Ph.D., before the New York Section of the International Association for Dental Research, the 40 per cent figure was arrived at by showing that teeth treated topically with fluorine showed 5.2 new caries per 100 noncarious teeth while those not so treated showed 8.8 new caries per 100 noncarious teeth. The reduction is, therefore, equal to 3.6 caries per 100 teeth or roughly one cavity less for every 25 teeth. It should be remembered that since we are dealing with averages, the higher rates of reduction in dental decay may well apply to those mouths that were relatively immune in the first place. This information deserves at least as wide circulation as the 40 per cent reduction figure now being disseminated to the public.

There is great danger that the real benefits of sodium fluoride may be vitiated and denied the children of our country by unwise overenthusiasm. Let us not repeat the mistakes made on previous occasions on the introduction of new methods, materials, and procedures into dental practice. The patient should be given all the facts, even if they are not glamorous.

J. A. S.

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The Influence of Mechanical Factors on the Development and Structure of Bone: By William Townsley, *Am. J. Phys. Anthropol.*, new series, **6**: 25-45, March, 1948.

Wolff's law (Wolff, 1892) is usually stated as follows: "Every change in the form and function of a bone, or of function alone, is followed by certain definite changes in the internal architecture and equally definite secondary alterations in the external conformation in accordance with mathematical laws."

This law has been subjected to considerable criticism by those who adhere to a primary or inherent growth pattern theory as the causative factor in the production of bone form and architecture. Wolff, however, referred to the final functioning structure; he made no reference to the processes of growth or to the means by which the final structure is formed, and though the processes of growth or repair (that is, deposition and absorption of bone) must be involved, he claimed only that their specific direction is determined by the function, not they themselves, and he left growth, as growth, an independent vegetative part of osteogenetic tissue with all the genetic direction peculiar to it.

A radiological investigation has been made of the structure and development of the cortical and cancellous bone in the femur, both in the human subject at different periods of life and in animals representing successive evolutionary stages. The internal architecture and external shape of the femur at various stages of human development have been correlated with the appearance of the corresponding groups of bony trabeculae on the phylogenetic scale, and the dependence of the architecture and external shape on changing mechanical requirements has been demonstrated both in ontogenetic and phylogenetic development.

The radiographs showed that in the fetal and early postnatal bones there are, in the ossified part of the structure, longitudinal bars or trabeculae of bone which are more or less parallel to one another and which exhibit only a slight divergence toward the extremities. Shortly before the age of 12 months, corresponding with the onset of increased muscle contraction and standing and walking, there is absorption of the fetal pattern and complete reformation of the cancellous bone on a "cross-braced" plan, as in the adult bone, to withstand the strains and stresses of walking.

There is a continuous change in the form of the bony material of the femur throughout the growth period. As the bone enlarges in both longitudinal and transverse dimensions, the processes of absorption and reconstitution of the bone element proceed together in the compact and cancellous tissues. The architecture of the internal trabeculae undergoes a change so that the original almost parallel trabeculae of the fetal and early postnatal femora are absorbed by the end of the first year and the new cross-braced systems of bony trabeculae in the head and neck are laid down. Further, with the progressive decrease in the angle of the neck throughout childhood, there is simultaneous absorption and

deposition of bone, on mechanical principles, in the correct places, both in the external compact tissue of the neck and in the internal trabeculated plates. The internal architectural features conform to the change in external form while still retaining their general pattern and efficiency as supporting structures.

The cross-braced system of curved trabeculated plates which has appeared in the neck region of the femur before 1 year of age remains unchanged in general form from that time onward but is reconstructed as regards details, with the object of supporting the greater stresses imposed upon the neck by its adoption of a more horizontal position. These detailed changes include a thickening of the compacta on the medial aspect of the neck and an increase in the number and strength of the transecting trabeculated plates to prevent collapse of the tube at its curved part.

The secondary bone center appears in the head at or shortly after the end of the first year, and as it enlarges it shows a pattern of transecting trabeculae which develop on the plan already adopted by the adjacent part of the neck, and so it harmonizes with the developing architecture of that region. The lines of the trabeculae in the enlarging epiphysis correspond to those in that region of the neck with which the epiphysis becomes confluent. The epiphysial pattern defines the future cross-braced system of the head of the femur.

Following the appearance of the epiphysis about the age of 1 year, its architecture becomes gradually more defined and at 2½ years the vertical trabeculae (which withstand greater pressure forces) are heavier and stronger than the horizontal trabeculae. At 4 years of age when the epiphysial mass of bone is much larger, the adult pattern is clearly established.

The cross-braced arrangement of trabeculae in the head of the adult bone provides a mechanically sound structure which resists the pressure forces directed at it from various angles during movements of the joint, and, especially and most consistently, from above. This trestle-like, pressure-resisting architecture is evident in all sections—horizontal, coronal, and sagittal. The superficial compact bone of the head is supported, therefore, by trabeculae which transmit pressure forces directly along their long axes to the whole circumference of the tube (neck of femur) on which the head is supported.

The following statements may be made regarding the appearance of the mechanically sound architecture during the first year:

(a) In the individual the appearance of the adult type of architecture follows the imposition of new forces on the femur due to weight-bearing, walking, and increased muscle contraction.

(b) The diaphyseal bone has not grown sufficiently far into the angulated cartilaginous neck to require or permit the formation of a cross-braced osseous system before the middle or end of the first year.

The elongation and curvature of the neck represent a mechanical arrangement developed on the phylogenetic scale in response to other evolutionary changes such as rotation and adduction of the limbs between reptiles and mammals and, in the higher forms, change in the mode of progression from quadrupedal to bipedal locomotion. In man, the pelvis has become broader, the femora inclined more medially, and the neck elongated. The appearance of the relatively long angulated neck and cross-braced systems of cancellous bone in response to mechanical requirements is late both in phylogeny and ontogeny.

In this paper an attempt has been made to show that Wolff's law holds good for the arrangement of bone substance at each stage in the changing, evolving structure of the femur throughout the vertebrate kingdom, and in the growing human femur in which the mechanically efficient architecture appears at the age at which weight-bearing and walking begin. This law also applies to bone growth associated with pathologic conditions.

It has been shown elsewhere (a) that removal of the gluteal muscles in an immature mammal (that is, before ossific centers have appeared) does not prevent the subsequent appearance of a great trochanter, and (b) that a representation of a femur will develop from the mesenchyme of a chick limb bud cultivated in vitro. Some authorities claim that these experiments disprove Wolff's law and state that the intrinsic growth pattern theory is all-important. It must be remembered, however, that strains and stresses have been applied to the femora of the ancestors of the particular chick or animal involved, and the result has been an architectural evolution, on mechanical principles, throughout phylogenetic development. The mechanically determined structures now present themselves as hereditary features in the individual, young, growing femur which has been protected experimentally from the stresses and strains of muscle pull and weight-bearing.

Treatment by Diet: By Clifford J. Barborka, B.S., M.S., M.D., D.Sc., F.A.C.P., Assistant Professor of Medicine, Northwestern University Medical School, Chicago; Attending Physician, Passavant Memorial Hospital; Consultant in Gastro-enterology and Gastroscopy, Diagnostic Center, Hines Veterans Hospital; Formerly Consulting Physician, The Mayo Clinic. 14 plates, including 13 in color. Pp. xvii 784. Price, $10. Fifth edition. Philadelphia, J. B. Lippincott Company, 1948.

In the fifth edition of his book, Barborka has incorporated presently accepted methods and treatment by diet. With respect to diet and dental caries, important factors are presented that may influence dental caries and oral hygiene. No mention is made, however, of the dental condition of children in European countries who are subject to restricted diets during wartime. The author presents the fact that while it may be accepted that inadequate diet produces conditions that predispose to dental caries, present knowledge would seem to indicate the interrelationship of nutritional and environmental factors in the causation of dental caries.

Chapters are presented on diet and health and on diseases and the application of diet therapy. Among the diseases for which specific diets are prescribed are diabetes, overweight, underweight, peptic ulcers, and the vitamin deficiency diseases. Food allergy is discussed and discussions are provided for the application of elimination diets. In the appendix are included average weight tables for purposes of dietary analysis, tables giving the nutritive value of selected foods, recommended dietary allowances, and recipes for the preparation of special foods used in treatment by diet. An extensive bibliography and detailed index are included.

When a Child Sucks His Thumb: By Nina Ridenour, Ph.D., In collaboration with Isabel Johnson. Drawings by Barbara Cooney. Pp., 8. Price, 10 cents. Published by the New York City Committee on Mental Hygiene, 105 East 22nd. Street, New York 10.

This is one of a series of pamphlets on special problems of children published by the New York City Committee on Mental Hygiene. Among the topics treated are various untoward behavior and habit practices of children. The purpose of the pamphlet is to bring parents and teachers a point of view which will make their relations with children smoother and more constructive. The material is presented for the lay reader under the subheading, "Thumb Sucking Is Generally Harmless." The information is provided that there are no facts to justify the fears that thumb sucking will spoil the shape of the teeth and jaw. In our opinion, this is contrary to the accepted belief of orthodontists.

It is generally felt that thumb sucking when engaged in over a long period of time until the child reaches school age can be harmful to the occlusion of the teeth and appearance of the face. The statement is made in this pamphlet that while "thumb sucking can affect the shape of the teeth and jaw—the effect is usually not permanent." The fact remains that when an effect is produced it is seldom permanent if the habit is discontinued before the permanent teeth begin to erupt. The statement is also made that "in most cases the jaws come back to normal position when the thumb sucking ceases," and that "parents' concern is usually unnecessary." This statement falls short of the fact in that it gives advice without stressing the fact that the length of time the habit is practiced, the intensity of the habit, and the general health of the child are important factors in the self-correction of dental deviations in thumb-suckers.

The natural need for sucking is explained and advice is given on the mother's approach toward breaking the habit in the child. Do's and don't's are provided which should prove helpful to dentists and orthodontists who are frequently consulted by mothers for assistance in trying to break the habit when it is practiced by their children.

News and Notes

The American Association of Orthodontists
Forty-fifth Annual Meeting, May 2, 3, 4, 5, and 6, 1949
Commodore Hotel, New York, N. Y.

BRING THE LADIES

The American Association of Orthodontists urges the ladies to attend the meeting in New York on May 2 to 6, 1949. A cordial welcome awaits. Plans are well advanced for the entertainment and pleasure of the ladies so that the special interests of each one in coming to New York will be satisfied.

These include:

1. A boat trip around Manhattan Island (with husbands) on the morning of the first day (Monday).

2. A "get acquainted" tea for the ladies on the afternoon of the first day, given under the auspices of the Northeastern Society of Orthodontists.

3. Reservations are being made to attend television and radio broadcasts.

4. Opportunities will be arranged to tour Radio City and to attend a show at the famous Radio City Music Hall.

5. An exceptional treat for the ladies is the Tuesday luncheon which will have as its speaker the renowned Mrs. M. Cochrane Cole, who will demonstrate her technique and theories in beautiful flower arrangements and the use of decorative fabrics.

6. Groups of tickets have been reserved for the ladies (and husbands) for three or four popular shows which will please all tastes (Tuesday evening).

7. On Wednesday evening the members and guests and their wives will enjoy attending the President's reception, banquet, entertainment, and dance. Dress for this is optional, and it will be a most enjoyable evening.

8. A trip to the United Nations has been planned with a guided tour through its buildings and its open sessions.

In addition to all these things there will be plenty of time available for shopping and individual sight-seeing—and the Ladies Committee will be ready and willing to help out with information at all times.

A questionnaire will be sent out soon to all members and their wives. It is urged that these be filled in as soon as possible since orders for theater tickets and tours will be reserved in the order of the mailing of the questionnaire, and an early return of the questionnaire will assure the desired tickets.

NORMAN L. HILLYER, Chairman, Ladies Program.

American Board of Orthodontics

The 1949 meeting of the American Board of Orthodontics will be held at the Commodore Hotel, New York, N. Y., April 28, 29, 30, and May 1. Orthodontists who may desire to be certified by the Board may obtain application blanks from the Secretary, Dr. Stephen C. Hopkins, 1726 Eye Street, N.W., Washington 6, D. C.

Prize Essay Contest, American Association of Orthodontists

Eligibility.—Any member of the American Association of Orthodontists; any person affiliated with a recognized institution in the field of dentistry as a teacher, researcher, undergraduate or graduate student shall be eligible to enter the competition.

Character of Essay.—Each essay submitted must represent an original investigation and contain some new significant material of value to the art or science of orthodontics.

Prize.—A cash prize of $500 is offered for the essay judged to be the winner. The committee, however, reserves the right to omit the award if in its judgment none of the entries is considered to be worthy. Honorable mention will be awarded to those authors taking second and third places. The first three papers will become the property of the American Association of Orthodontists and will be published. All other essays will be returned.

Specifications.—All essays must be typewritten on 8½ by 11 inch white paper, double spaced with 1 inch margins, and composed in good English. Three copies of each paper, complete with illustrations, bibliography, tables, charts, etc., must be submitted. The name and address of the author must not appear in the essay. For purposes of identification, the author's name together with a brief biographical sketch which sets forth his or her dental and/or orthodontic training, present activity, and status (practitioner, teacher, student, research worker, etc.) should be typed on a separate sheet of paper and enclosed in a sealed envelope. The envelope should carry the title of the essay.

Presentation.—The author of the winning essay will be invited to present it at the meeting of the American Association of Orthodontists to be held in New York City, New York, May 2-6, 1949.

Final Submission Date.—No essay will be considered for this competition unless received in triplicate by the Chairman of the Research Committee on or before March 15, 1949.

ALLAN G. BRODIE, Chairman Research Committee,
American Association of Orthodontists,
30 North Michigan Avenue, Chicago 2, Ill.

Pacific Coast Society of Orthodontists

The regular biennial meeting of the Pacific Coast Society of Orthodontists will be held Feb. 21, 22, and 23, 1949, at the Palace Hotel, San Francisco, California.

Central Section, Pacific Coast Society of Orthodontists

The next meeting of the Central Section of the Pacific Coast Society of Orthodontists will be held Feb. 21, 22, and 23, 1949, at San Francisco.

Southwestern Society of Orthodontists

The 1949 meeting of the Southwestern Society of Orthodontists will be held at the Texas Hotel, Fort Worth, Texas, March 13, 14, 15, and 16, inclusive, 1949.

The Cincinnati Dental Society

The Cincinnati Dental Society takes pleasure in announcing that its March Clinic Meeting and Children's Dental Health Day will be held at the Netherland Plaza Hotel on March 20, 21, and 22, 1949.

Thomas P. Hinman Midwinter Clinic

The Thomas P. Hinman Midwinter Clinic will be held at the City Auditorium, Atlanta, Georgia, on March 20, 21, 22, and 23, 1949, under the auspices of the Fifth District Dental Society.

Dental Company Clarifies Confusion of Firm Names

L. B. Vernon, president of the Vernon-Benshoff Company, Pittsburgh, manufacturers of dental supplies, has announced that his company is in no way connected with the Vernon G&R Company of Pittsburgh, which is said to be sending out empty boxes to dentists asking for gold scrap.

Dr. Hunter I. Miller, Flint, Michigan, at the recent meeting of orthodontists in Cleveland, Ohio, discussed returns from shipments to refiners of orthodontic metal scrap. During the discussion, a report of a transaction with the Vernon G&R Company was made. Some men present had the impression that the Vernon-Benshoff Company was involved in this transaction. The Vernon-Benshoff Company was in no way connected with the transaction or the discussion.

Clearinghouse on Child Life Research Established in Children's Bureau

A clearinghouse for research in child life has recently been established in the Children's Bureau as an aid to research workers in keeping abreast with studies in progress. The Children's Bureau is a unit of the Social Security Administration, Federal Security Agency.

The clearinghouse has been set up in response to numerous requests from research workers and professional organizations who believe that such a center will promote collaboration and interchange of information on current research in the various fields affecting child life. Lack of a central clearinghouse has in the past been a handicap to many investigators because there has been no one place where they could find out about current projects in their own fields or related ones.

Research workers agree that the availability of such information will encourage more cooperative planning, as it can be a communicating device for investigators in different specialties. The clearinghouse will provide a systematic way to keep professional people informed about research in progress, and to bridge the time-gap between completion and publication of work.

The establishment of a clearinghouse in the Children's Bureau grew out of a series of conferences held during the past year to review what is going on in research in child life, what the gaps are, and how the needs for research can be met. Representatives of many fields in child life research participated in one or more of these conferences.

These representatives recommended that the Children's Bureau develop a center for information about projects pertaining to children and mothers being undertaken by one or more of the various disciplines. In mid-September an advisory committee met with the Children's Bureau staff to help work out the best way to get the clearinghouse started.

The clearinghouse will canvass investigators in various fields for reports of studies in progress, including collections of unpublished data. A bulletin will be released in 1949 to inform research workers about ongoing research in child life. The clearinghouse will provide information to research workers on request.

The Children's Bureau emphasizes that the clearinghouse will not attempt to summarize or indicate the conclusions of research projects, but will furnish accounts of the nature of projects as reported to it by individuals or organizations. Many researchers will be asked to prepare their own brief descriptive statements about projects, on report forms, and results or conclusions will not be included except as may be desired by the investigator himself. Participation will be voluntary, but it is hoped that cooperation will be extensive as the value of the clearinghouse will be dependent upon its scope and coverage.

Inquiries may be directed to Dr. Clara E. Councell, Director, Clearinghouse, Children's Bureau, Federal Security Agency, Washington 25, D. C.

Notes of Interest

Henry D. Furgatch, D.D.S., wishes to announce the limitation of his practice to orthodontics exclusively at 31 East 12th Street, New York 3, New York, telephone Algonquin 4-2557.

Dr. Ernest T. Klein announces the removal of offices to 632 Republic Building, Denver 2, Colorado, practice limited to orthodontics, telephone Alpine 9479.

Dr. Harold E. Leslie wishes to announce the removal of his office from 345 Bloor Street West to the Leslie Building, 394 Bloor Street West, Toronto, Canada, telephone Mi. 6070, practice limited to orthodontics.

Dr. Marius L. Poles, 44 Church Street, Paterson, New Jersey, wishes to announce the opening of a branch office at 124 Clifton Avenue, Clifton, New Jersey, practice limited to orthodontics.

Robert C. Drelich, D.D.S., M.S., announces the opening of offices at 2749 Boulevard near Sip Avenue, Jersey City 6, New Jersey, hours by appointment, phone BErgen 3-1630, practice limited to orthodontics.

Dr. Erman D. Rauch wishes to announce the limitation of his practice exclusively to orthodontics at 315 Frisco Building, Joplin, Missouri.

OFFICERS OF ORTHODONTIC SOCIETIES

The AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY is the official publication of the American Association of Orthodontists and the following component societies. The editorial board of the AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY is composed of a representative of each one of the component societies of the American Association of Orthodontists.

American Association of Orthodontists

President, Lowrie J. Porter - - - - - - - - - - 41 E. 57th Street, New York, N. Y.
President-Elect, Max E. Ernst - - - - 1250 Lowry Medical Arts Bldg., St. Paul, Minn.
Vice-President, William R. Humphrey - - - - - - - 1232 Republic Bldg., Denver, Colo.
Secretary-Treasurer, George R. Moore - - - - - - 919 Oakland Ave., Ann Arbor, Mich.

Central Section of the American Association of Orthodontists

President, Joseph H. Williams - - - - - - - - 3720 Washington Blvd., St. Louis, Mo.
Secretary-Treasurer, Earl E. Shepard - - - - - - - - - 4500 Olive St., St. Louis, Mo.

Great Lakes Society of Orthodontists

President, Wilson R. Flint - - - - - - - - - - - - Jenkins Arcade, Pittsburgh, Pa.
Secretary-Treasurer, Scott T. Holmes, 509 Hackley Union National Bank Bldg., Muskegon, Mich.

Northeastern Society of Orthodontists

President, Norman L. Hillyer - - - - - - - - - Professional Bldg., Hempstead, N. Y.
Secretary-Treasurer, Oscar Jacobson - - - - - - - - - 35 W. 81st St., New York, N. Y.

Pacific Coast Society of Orthodontists

President, S. B. Hoskins - - - - - - - - - - - Medical Dental Bldg., Portland, Ore.
Secretary-Treasurer, Frederick T. West - - - - - - 870 Market St., San Francisco, Calif.

Rocky Mountain Society of Orthodontists

President, Harry V. Banks - - - - - - - - - - - - 1550 Lincoln St., Denver, Colo.
Vice-President, Elmer S. Linderholm - - - - - - - - - 1558 Humboldt St., Denver, Colo.
Secretary-Treasurer, Ernest T. Klein - - - - - - - - 632 Republic Bldg., Denver, Colo.

Southern Society of Orthodontists

President, Samuel D. Gore - - - - - - - - - Maison Blanche Bldg., New Orleans, La.
Secretary-Treasurer, Frank P. Bowyer - - - - - - Medical Arts Bldg., Knoxville, Tenn.

Southwestern Society of Orthodontists

President, J. C. Williams - - - - - - - - - - Medical Arts Bldg., Fort Worth, Texas
Secretary-Treasurer, Marion A. Flesher - - - - - Medical Arts Bldg., Oklahoma City, Okla.

American Board of Orthodontics

President, Bernard G. deVries - - - - - - - - - Medical Arts Bldg., Minneapolis, Minn.
Vice-President, Joseph D. Eby - - - - - - - - - - - 121 E. 60th St., New York, N. Y.
Secretary, Stephen C. Hopkins - - - - - - - - 1726 Eye St., N. W., Washington, D. C.
Treasurer, James A. Burrill - - - - - - - - - - - 25 E. Washington St., Chicago, Ill.
James D. McCoy - - - - - - - - 405 North Bedford Drive, Beverly Hills, Calif.
Reuben E. Olson - - - - - - - - - - - - - 712 Bitting Bldg., Wichita, Kan.
Raymond L. Webster - - - - - - - - - - 133 Waterman St., Providence, R. I.

A List of the Orthodontic Societies of the World and Their Principal Officers*

Chicago Association of Orthodontists

President, Ernest Myer - - - - - - - - - - - - 180 N. Michigan Ave., Chicago, Ill.
President-Elect, B. F. Dewel - - - - - - - - - - - - 708 Church St., Evanston, Ill.
Secretary-Treasurer, Howard J. Buchner - - - - - - - - - 1011 Lake St., Oak Park, Ill.

Harvard Society of Orthodontists

President, Sidney P. Stone - - - - - 21 Columbia Road, Grove Hall Station, Boston, Mass.
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Secretary, Harold J. Nice - - - - - - - - - - 475 Commonwealth Ave., Boston, Mass.

New York Society for the Study of Orthodontics

President, Abbey E. Weinstein - - - - - - - - 25 Central Park W., New York, N. Y.
Vice-President, Lawrence Goodman - - - - - - 135-09 109th Ave., Richmond Hill, N. Y.
Secretary-Treasurer, H. Allen Bimston - - - - - 1882 Grand Concourse, New York, N. Y.

New York University Orthodontic Society

President, Robert J. DiTolla - - - - - - - - - - - 5 E. 53rd St., New York, N. Y.
Secretary-Treasurer, Benjamin Ackerman - - - - - 7616 Bay Parkway, Brooklyn, N. Y

Philadelphia Society of Orthodontists

President, John W. Ross - - - - - - - - - - - - 1520 Spruce St., Philadelphia, Pa.
Secretary, Augustus L. Wright - - - - - - - - - - 255 S. 17th St., Philadelphia, Pa.

St. Louis Society of Orthodontists

President, Leo M. Shanley - - - - - - - - - - - 7800 Maryland Ave., Clayton 5, Mo.
Vice-President, Earl Sheppard - - - - - - - - - - - 4500 Olive St., St. Louis, Mo.
Secretary-Treasurer, Everett W. Bedell - - - - - - 1504 S. Grand Blvd., St. Louis 4, Mo.

Washington-Baltimore Society of Orthodontists

President, Hammond Johnston - - - - - - - - - - - 828 Park Ave., Baltimore, Md.
Vice-President, William D. Curtis - - - - - - - 1726 Eye St., N.W., Washington, D. C.
Secretary-Treasurer, Carlotta A. Hawley - - - - - 915 19th St., N.W., Washington 6, D. C.

Foreign Societies

British Society for the Study of Orthodontics

President, M. W. Rushton - - - - - - - - - - - - Guy's Hospital, S. E. 1, London
Secretary, K. E. Pringle - - - - - - - - - - - 12 Manchester Square, W.1, London
Treasurer, Harold Chapman - - - - - - - - - - 6 Upper Wimpole St., W.1, London

Sociedad Argentina de Ortodoncia

President, Miguel A. Finocchietti - - - - - - - - - - - Serrano 638, Buenos Aires
Secretary, Samuel Pisarenko - - - - - - - - - - - - Esmeralda 860, Buenos Aires
Treasurer, Antonio J. Guardo - - - - - - - - - - - Pueyrredon, 2338, Buenos Aires

*In the January issue of the AMERICAN JOURNAL OF ORTHODONTICS is published each year a list of the orthodontic societies of the world of which the JOURNAL has any record, along with the names and addresses of their principal officers.

The JOURNAL keeps a file for each of these societies and publishes the names that appear in that file as of the date of going to press.

Sociedad Brasileira de Ortodoncia

President, Joaquim Cavalcanti - - - - - - - Praca G. Vargas 2, S. 422, Rio de Janeiro
Vice-President, Kant Duarte - - - - Rua Manuel de Carvalho, 16-9°, S. 91, Rio de Janeiro
Secretary, Virgilio Moozen - - de Oliverira, Av. Rio Branco 311-6°, S. 613, Rio de Janeiro

Sociedad de Ortodoncia de Chile

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Vice-President, A. Arturo Toriello - - - - - - - - - - - - Londres No. 63, Santiago
Secretary, Juan Colin Montandon - - - - - - - - - - - San Martin No. 133, Santiago
Treasurer, Pedro Gandulfo Guerra - - - - - - - - - - - - Londres No. 63, Santiago

Sociedad Colombiana de Ortodoncia

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Vice-President, Obdulio Mendez - - - - - - - - - - - - Calle 12, No. 15-06, Bogota
Secretary-Treasurer, Marco Novoa - - - - - - - - - - - - Calle 11, No. 17-30, Bogota

Cuban Association of Orthodontists

President, Carlos Coro - - - - - - - - - - - - - - - - - - Virtudes 618, Habana
Vice-President, Dario Gandarias - - - - - - - - - - Calle 25, No. 954, Vedado, Habana
Secretary-Treasurer, Dra. Margarita Amézaga - - - - - - - - - Virtudes 618, Habana

Guatemalan Association of Orthodontics and Relative Sciences

Secretary, Enrique Estrada H. - - - - - - - - Apartado de Correos No. 110, Guatemala

Asociación Méxicana de Ortodoncia

President, Guillermo Gamboa - - - - - - - - - - - - - - Madero 34, Mexico City
Secretary, Rutilio Blanco - - - - - - - - - - - - - - - - Donceles 98, Mexico City
Treasurer, Carlos M. Paz - - - - - - - - - - - - - - - Insurgentes 72, Mexico City

Sociedad Peruana de Ortodoncia

President, Augusto Taiman - - - - - - - - - - - - - - - - - - Arzobispo 284, Lima
Vice-President, Ricardo Salazar - - - - - - - - - - - - - - Edificio Olaya 38, Lima
Secretary, Carlos Elbers - - - - - - - - - - - - - - - - - - Arzobispo 284, Lima
Treasurer, Gerardo Calderon -

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